

Message

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**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 10/29/2019 2:39:23 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** FW: Round 6 - 10 ppb Quote  
**Attachments:** ATT00001.txt

Hi Tom,  
Quote for Enthalpy 10ppb analyses is below. I'll proceed with the PO.

Thanks


**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
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**Contractor to the USEPA**

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**From:** Bryan Tyler | Enthalpy Analytical [bryan.tyler@enthalpy.com]  
**Sent:** Tuesday, October 29, 2019 10:32 AM  
**To:** Craig Williams  
**Subject:** RE: Round 6 - 10 ppb Quote

Yes – that is what we suggest.

Bryan Tyler  
VP Environmental Laboratory Services

  
800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Tuesday, October 29, 2019 10:30 AM  
**To:** Bryan Tyler | Enthalpy Analytical <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Subject:** RE: Round 6 - 10 ppb Quote

Hi Bryan,  
Just confirming that your proposing using the 1200 cc/min samplers for both the 505 second and 596 second samples?

Thanks

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
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---

**From:** Bryan Tyler | Enthalpy Analytical [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Tuesday, October 29, 2019 12:19 AM  
**To:** Craig Williams  
**Subject:** Round 6 - 10 ppb Quote

Hi Craig,  
See proposal for Round 6, 10ppb.

**Round 6 Scope:**

Test will be 4 days on a small vehicle gasoline engine in the Light-Duty Dynamometer Facility.

Total canisters needed is 25

Total samplers needed is 22 as described below:

- 3@505 seconds.
- 10@1372 seconds
- 9@596 seconds.

**Enthalpy Proposal, 10 ppb:**

Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, EPA Method TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Scan mode.

We anticipate analyzing approximately 25 canisters collected from active combustion sources at a 20x dilution with an expected reporting limit (RL) of 10ppb. In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10ppb reporting limit, and by EPA Method 3C (O2, CO2, Methane, CO) with a 0.10% reporting limit.

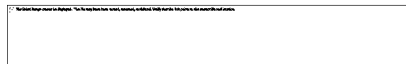
The total cost for this project is Ex. 3 Deliberative Process (DP) which includes the analysis of up to 25 canisters at a 10 ppb RL. Included is a GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

**Supplies to be ready on 11/8/2019:**

*Supplies provided by Enthalpy:*

- 25 x 15L Sampling Canisters (Batch 0.10ppb TO-15)
- 10 x ~600 cc/min Canister Samplers
- 12 x 1200 cc/min Canister Samplers

Bryan Tyler  
Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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## Message

**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 10/4/2019 2:00:06 PM  
**To:** Faircloth, James [Faircloth.James@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]  
**Subject:** RE: Enthalpy Round 5

The vehicle was involved in an accident and it's currently being repaired. They expect repairs to be completed by 10/10. The current plan is fly Russell back to Detroit then and continue testing so he will not be here the week of October 14th.

I've touched base with Daniel and he feels that he'll be available the week of 10/14. I just have to confirm with his supervisor. I'll also looking for a second person and I'll get back to you all next week.

Craig

**Craig Williams**  
Engineer  
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**From:** Faircloth, James [Faircloth.James@epa.gov]  
**Sent:** Friday, October 04, 2019 7:05 AM  
**To:** Long, Thomas; Craig Williams  
**Cc:** Snow, Richard  
**Subject:** RE: Enthalpy Round 5

Talking to Russell yesterday about the sampling trip in Detroit he indicated that until the electric vehicle gets repaired, they are done in Michigan. I believe he's booked a flight home.

-James

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**From:** Long, Thomas <Long.Thomas@epa.gov>  
**Sent:** Friday, October 04, 2019 7:01 AM  
**To:** Craig Williams <CWilliams@css-inc.com>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** Re: Enthalpy Round 5

We will need at least one technician, but if two were available we could use them both. We were aware that Russell would not be available for this round of testing.

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**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Thursday, October 3, 2019 3:25 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** RE: Enthalpy Round 5

Tom,  
How many people will you need for Phase 5 support from Jacobs? Based on my last conversation with him, Russell is out and not scheduled to return until October 17. I'm checking with him to confirm nothing has changed. He also has PTO planned for the week of October 21.

Craig



**Craig Williams**  
Engineer  
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**From:** Craig Williams  
**Sent:** Thursday, October 03, 2019 10:08 AM  
**To:** Long, Thomas  
**Cc:** Snow, Richard; Faircloth, James  
**Subject:** RE: Enthalpy Round 5

Hi Tom,  
Enthalpy replied that they can provide supplies for testing on October 14 and that they plan on cleaning Phase 3 and Phase 4 canisters starting tomorrow unless we advise otherwise. Can I advise them that is OK to clean canisters from Phase 3 and Phase 4?

Thanks

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
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**From:** Craig Williams  
**Sent:** Thursday, October 03, 2019 9:35 AM  
**To:** Long, Thomas  
**Cc:** Snow, Richard; Faircloth, James  
**Subject:** RE: Enthalpy Round 5

Hi Tom,  
I've requested an updated quote from Enthalpy for Phase 5 and am waiting on a reply.

Craig


**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
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---

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** Wednesday, October 02, 2019 3:13 PM  
**To:** Craig Williams; Williams, Craig  
**Cc:** Snow, Richard; Faircloth, James  
**Subject:** Enthalpy Round 5

Well, we had our meeting this morning and things have changed a bit. Instead of testing a heavy-duty gas truck, we're going to re-test the F750.

We would like to commence testing on the 14<sup>th</sup> or at least no later than the 21<sup>st</sup>.

James will confirm availability of the .

Craig, can Enthalpy provide the necessary cans and controllers in that time-frame? It would mean having the cans/controllers on the 11<sup>th</sup> (14<sup>th</sup> at the latest).

Here is an overview of the proposed testing:

### Round 5

Vehicle: Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) 6.7L, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF (PTO<sub>x</sub>), SCRC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedules:

- Transient 3 Warm-up (no samples?)
- 20 minute soak
- Transient 3 (668 seconds, 2.85 miles)
- 20 minute soak
- HD-UDDS (1060 second, 5.5 miles)
- 25 minute soak (to allow for reading bags)
- Steady acceleration to 60 mph and hold for six minutes. Sample for the last 5 minutes at steady state.

Stop sampling as the vehicle decelerates to 0 and turns off.

SUMMA cans for EtO and TO-15 analyses will be collected at three locations: pre-SCR, post-DPF, and dilution tunnel. A background can will be collected in the test bay during the HD-UDDS.

Total Cans Round 5 –

3 source cans per cycle, 3 days with 3 cycles, 27 source cans

1 ambient can per test day, 3 ambient cans

1 blank

1 spiked steady state on each of two days, 2 spiked cans

1 can spiked with interferents as well as EtO

9 controllers at 668 seconds (for Trans3)

12 controllers at 1060 seconds (for HD-UDDS and ambient background)

12 controllers at 600 seconds (for steady state samples and spiked samples)

---

Thomas Long, Mechanical Engineer

Mail Drop E343-02

Building D Room 360

109 T. W. Alexander Drive

Research Triangle Park, NC 27711

Phone: 919-541-3944

## Message

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 10/2/2019 1:53:07 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]  
**CC:** Fernandez, Antonio [fernandez.antonio@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Kariher, Peter [Kariher.Peter@epa.gov]; Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]; George, Ingrid [George.Ingrid@epa.gov]; Hays, Michael [Hays.Michael@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Nessley, Libby [Nessley.Libby@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; McDonald, Joseph [McDonald.Joseph@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]; Rosati, Jacky [Rosati.Jacky@epa.gov]; Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Dodder, Rebecca [Dodder.Rebecca@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** A thought about future testing

Our light-duty facility is unavailable due to facility upgrades until November. It might be helpful to do some diesel testing prior to the E0 testing on the Ex. 4 CBI

**Round 5 (Oct 21-25)**

**Vehicle:** Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) I-6 6.7L, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF (PTOx), SCRC)

**Fuel:** Ultra-low sulfur diesel fuel.

**Lab:** Heavy-duty dynamometer facility.

**Sampling days:** 3

**Driving schedules:**

- Transient 3 Warm-up
- 20 minute soak
- Transient 3
- 20 minute soak
- HD-UDDS (1060 second, 5.5 miles)
- 25 minute soak (to allow for reading bags)
- Steady acceleration to 60 mph and hold for six minutes. Sample for the last 5 minutes at steady state. Stop sampling as the vehicle decelerates to 0 and turns off.

SUMMA cans for EtO and TO-15 analyses will be collected at three locations: pre-SCR (engine out), post-DPF (tailpipe out), and dilution tunnel. A background can will be collected in the test bay during the HD-UDDS.

**Total Cans Round 5 –**

3 source cans per cycle, 3 days with 3 cycles, 27 source cans

1 ambient can per test day, 3 ambient cans

1 blank

1 spiked steady state on each of two days, 2 spiked cans

9 controllers at 315 seconds (for Trans3)

12 controllers at 1060 seconds (for HD-UDDS and ambient background)

11 controllers at 600 seconds (for steady state samples and spiked samples)

Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide. Samples will be collected into batch blank checked Silco/Silonite lined sampling canisters (volume TBD). Samples will be returned to Enthalpy's lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

**Round 6 (Nov 11-15)**

Vehicle: Turbocharged GDI Ex. 4 CBI same vehicle as Round 1 and Round 4).

Fuel: Ethanol free fuel from a local station

Lab: Light-duty dynamometer facility.

Sampling days: Four test days.

---

Thomas Long, Mechanical Engineer

Mail Drop E343-02

Building D Room 360

109 T. W. Alexander Drive

Research Triangle Park, NC 27711

Phone: 919-541-3944

## Message

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 10/2/2019 1:39:01 PM  
**To:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** RE: Proposal

In the biodiesel study we described it as having a DOC.  
 The controllers include 1 controller per cycle.

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Snow, Richard <Snow.Richard@epa.gov>  
**Sent:** Wednesday, October 02, 2019 9:32 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** RE: Proposal

James is saying theres no DOC

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**From:** Long, Thomas <Long.Thomas@epa.gov>  
**Sent:** Wednesday, October 02, 2019 9:30 AM  
**To:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** Proposal

Vehicle: Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) SB I-6 6.7L, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)  
 Fuel: Ultra-low sulfur diesel fuel.  
 Lab: Heavy-duty dynamometer facility.  
 Sampling days: 3  
 Driving schedule:

Transient 3 Warm-up  
 20 minute soak  
 Transient 3  
 20 minute soak  
 HD-UDDS (1060 second, 5.5 miles)  
 25 minute soak (to allow for reading bags)  
 Steady acceleration to 60 mph and hold for six minutes. Sample for the last 5 minutes at steady state. Stop sampling as the vehicle decelerates to 0 and turns off.

SUMMA cans for EtO and TO-15 analyses will be collected at three locations: pre-SCR, post-DPF, and dilution tunnel. A background can will be collected in the test bay during the HD-UDDS.

Total Cans Round 5 –  
 3 source cans per cycle, 3 days with 3 cycles, 27 source cans  
 1 ambient can per test day, 3 ambient cans

1 blank

1 spiked steady state on each of two days, 2 spiked cans

3 controllers at 315 seconds (for Trans3)

4 controllers at 1060 seconds (for HD-UDDS and ambient background)

5 controllers at 600 seconds (for steady state samples and spiked samples)

.

Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide. Samples will be collected into batch blank checked Silco/Silonite lined sampling canisters (volume TBD). Samples will be returned to Enthalpy's lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

## Message

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 11/26/2019 2:42:47 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]  
**CC:** Walters, Charles [walters.charles@epa.gov]  
**Subject:** RE: Review of F650, Phase 5 EtO data  
**Attachments:** Enthalpy Report (Phase 5 F650 E10) 0819-263R.pdf

Here is the revision. And here I thought we'd caught something Chuck didn't notice!

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Cullen, Angela <cullen.angela@epa.gov>  
**Sent:** Tuesday, November 26, 2019 9:38 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>  
**Cc:** Walters, Charles <walters.charles@epa.gov>  
**Subject:** FW: Review of [REDACTED] Phase 5 EtO data

I added the email below to the agenda for this morning

---

**From:** Walters, Charles <walters.charles@epa.gov>  
**Sent:** Tuesday, November 19, 2019 8:05 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>  
**Subject:** Review of [REDACTED] Phase 5 EtO data

All,

I reviewed the data for the [REDACTED] Phase 5 EtO testing; here are my findings.

Reviewing the canister pressurization data on page 77, together with the controller data on page 78 of the Enthalpy report....

The controller flowrates selected for the 1060 s sample phase would suggest that 15 L canisters were used. However, the pressurization data and reported sample volumes indicate 6 L canisters. I suspect that 15 L canisters were actually used and this is a copy/paste issue in their pressurization spreadsheet. Furthermore, the spiking worksheets indicate 15 L canisters. If I back calculate all data using 15 L canister volume; the resulting calculated sample volume using the ideal gas law matches well with the expected sample volume based on flowrate and sample time.

My concern would be: Does this error continue downstream in the Enthalpy process to calculate a resulting concentration? I'm 95% convinced that the resulting canister Dilution Factor wouldn't change; however I don't know

enough about the Enthalpy analysis and process to be sure that the resulting calculated concentration in the canister isn't affected.

I suggest we ask ORD/Enthalpy about this.

Thanks,  
Chuck



Appointment

---

**From:** Cullen, Angela [cullen.angela@epa.gov]  
**Sent:** 11/26/2019 2:32:59 PM  
**To:** Baldauf, Richard [Baldauf.Richard@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]; Kariher, Peter [Kariher.Peter@epa.gov]; Nessley, Libby [Nessley.Libby@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]  
**Subject:** EtO Discussion  
**Location:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE  
**Start:** 11/26/2019 3:00:00 PM  
**End:** 11/26/2019 3:30:00 PM  
**Show Time As:** Tentative

**Required Attendees:** Richard Baldauf; Long, Thomas; Loftis, Kathy; Walters, Charles; Cook, Rich; Fernandez, Antonio; Laroo, Chris; Hoyer, Marion; Faircloth, James; Kariher, Peter; Nessley, Libby; Kolowich, Bruce

## Ex. 6 Personal Privacy (PP)

Please pass the invitation on to others, as appropriate

### Updated Agenda:

- Concern with results from Ex. 4 CBI HD Gasoline Truck (Phase 5) from Chuck Walters:

*Reviewing the canister pressurization data on page 77, together with the controller data on page 78 of the Enthalpy report....*

*The controller flowrates selected for the 1060 s sample phase would suggest that 15 L canisters were used. However, the pressurization data and reported sample volumes indicate 6 L canisters. I suspect that 15 L canisters were actually used and this is a copy/paste issue in their pressurization spreadsheet. Furthermore, the spiking worksheets indicate 15 L canisters. If I back calculate all data using 15 L canister volume; the resulting calculated sample volume using the ideal gas law matches well with the expected sample volume based on flowrate and sample time.*

*My concern would be: Does this error continue downstream in the Enthalpy process to calculate a resulting concentration? I'm 95% convinced that the resulting canister Dilution Factor wouldn't change; however I don't know enough about the Enthalpy analysis and process to be sure that the resulting calculated concentration in the canister isn't affected.*

- Status of testing/results from F150 LD Gasoline Truck (Phase 6)
- Status of contract for obtaining summa canisters from Enthalpy for nonroad testing at OTAQ
- Missing dyno data (Vmix and miles)
- Any bits of wisdom from Tom before he leaves us?

# HD Test Plan

## Purpose

The purpose of this test program is to complement the OTAQ data set generated with their Rep truck and their Ex. 5 Deliberative Process (DP) This data will add to the limited data set of emission rates generated on a chassis dynamometer for HDDTs, better understand SCR efficacy in different operating modes, which is of interest to the low NO<sub>x</sub> project, and generate VOC and SVOC data for the OAQPS database.

## Test Program Methods and Requirements

Use HD Chassis site. Request same driver to reduce variability. No deviations from the CFR except as specified in procedures.

## Test Articles

One vehicle selected from one of the following weight classes of Heavy-Duty Diesel Trucks depending on vendor availability:

- ☐ HDDT Class 8
- ☐ HDDT Class 7
- ☐ HDDT Class 6

Preference will be given to a truck with either an 8 liter Detroit Diesel or a Volvo without turbo compounding (a rare engine).

## Test Conditions

This program will test laden load conditions with one fuel. Funding was not sufficient to test for fuel effects with multiple fuels.

- ☐ In-use North Carolina diesel (with OTAQ fuel analysis)
- ☐ Laden inertial weight (dependent on vehicle class of the test article)

## Road Load Coefficients

Determined by onroad coastdowns with an empty trailer consistent with 40 CFR 1037.

## Dynamometer Test Plan

Cold Start test day:

HD-UDDS (Bag 1, 1060 s), 20 min soak, HD-UDDS (Bag 2, 1060 s), 20 min soak, HD-UDDS (Bag 1), 60 min idle (Bag 2, 3600 s), key-off, Supercycle (not measured, 5833 s) to condition ECM/DPF for next Cold Start test day

Hot Start test day:

Prep cycle: For this test plan we are using World Harmonized Vehicle Cycle (WHVC) as the warmup trace before any hot testing if longer than 20 minutes since last cycle.

1. Warm up: WHVC (1800 s), not measured
2. WHVC (1800 s), measured
3. Supercycle (5833 s)
4. WHVC (1800 s), measured
5. Supercycle (5833 s)

Given that our HD Chassis Dynamometer bench is limited to two bags, we will not be able to collect bags for the four phases of the Supercycle. It is proposed to calculate gaseous emission rates from the modal data. Due to personnel limitations, sampling on all phases will consist only of regulated gaseous emissions and PM. Carbonyls/ketone and oxygenate sampling will be omitted.

## Dynamometer Testing Timeline

### **Week 1:**

Day 1: Supercycle (5833 s) not measured

Days 2, 3, 4: Cold Start Test Days

Days 5: Hot Start Test Day

## Dynamometer Necessary Measurements

Criteria gaseous emissions using both bag (except Supercycle) and raw modal: THC, NMHC, CO, NO<sub>x</sub>

GHGs: CO<sub>2</sub>, CH<sub>4</sub> (RTP cannot measure real-time N<sub>2</sub>O)

Measure PM using filters with triplicate samples. In addition, use the EEPS for continuous PN/PS

Raw probe installed upstream of the exhaust aftertreatment.

## Portable Emissions Measurement System (PEMS) Test Plan

The test vehicle will be tested onroad over two routes local to the RTP campus. The SENSORS ECOSTAR Plus will be used to make gaseous emissions measurements. The 3DATX iPEMS will take duplicate measurements. In addition, if OTAQ loans RTP an AVL MSS, RTP will make real-time PM measurements.

### PEMS Testing Timeline

Day 1: Condition 1 Multi-speed RTP Route  
 Day 2: Condition 1 Multi-speed RTP Route  
 Day 3: Condition 1 If needed, High-speed Hillsborough Route  
 Day 4: Condition 2 Multi-speed RTP Route  
 Day 5: Condition 2 Multi-speed RTP Route  
 Day 6: Condition 2 If needed, High-speed Hillsborough Route

### PEMS Necessary Measurements

Criteria gaseous emissions including: THC, NO<sub>x</sub>, NO<sub>2</sub>, CO, CO<sub>2</sub> on the ECOSTAR

Duplicate measurements on the iPEMS

☐ PM using AVL MSS if loaned by OTAQ

### Testing Support Functions

CAN data to be logged for both dynamometer and PEMS test days.

### VOCs and Ethylene Oxide

This program includes the VOC and EtO sampling of the truck. There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both cycles will be sampled on each of the 3 days of cold start testing. One of the three cold starts will have duplicate samples. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Round 6 – 7 source, 7 ambient, 1 blank, 1 spiked = 16 total (not including spare)

4 controllers for 1060 seconds for two of the three days

7 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@1060 seconds.

- 1 controller/can duplicate for one of the three days for cold start, source 1@1060 seconds
- 1 controller/can for each of three days for warm start HD-UDDS, source, 3@1060 seconds
- 1 controllers/cans for stabilized/spiked for the third day, source, 1@1060 seconds
- 2 controllers/cans for background ambient per each of three days, 6@1060 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

### **Applicable QAPP**

NRMRL Mobile Source Emissions Measurement and Characterization QAPP

## Tentative Schedule

Complete: Test fuel receiving (James|Snow|Russ)

Jan 6, 2020; 1 Week: Receive and prep truck for PEMS testing

Jan 13, 2020; 1 Week: Onroad coastdowns

Jan 20 - Holiday

Jan 21, 2020; 4 days: HD dyno calibrations/rig transfer tube

Jan 27, 2020; 1 Week: HD dyno testing

Feb 3, 2020; 2 Weeks: PEMS Testing (James|Russ|Daniel)

Feb 17 – Holiday

Feb 18, 2020; 1 Week: Prep truck for return and return

## Title

Mobile Source Ethylene Oxide (EtO) Emissions Measurement and Characterization

## Vehicles

- Ex. 5 Deliberative Process (DP) with 5,570 miles on a 2.7 L turbocharged wall-guided GDI
- with NNNN miles on a 6.7L heavy-duty diesel truck (HDDT) equipped with EGR, DPF, SCR, and DOC.
- A heavy-duty spark ignition vehicle
- Template: YYYY Make Model with NNNN miles on a NN liter <turbocharged|naturally aspirated><PFI|Diesel|GDI>

Vehicles were selected at the request of the Office of Transportation and Air Quality (OTAQ).

## Chassis Dynamometer Driving Schedules

The light-duty vehicles were/will be tested at an ambient temperature of 72 °F (22 °C).

- [ [HYPERLINK "http://www.epa.gov/otaq/emisslab/methods/huddscol.txt"](http://www.epa.gov/otaq/emisslab/methods/huddscol.txt) ] (FTP)
- The Supplemental FTP (SFTP) also known as US06

The heavy-duty vehicles were/will be tested in the laden condition (90% GCWR).

- Cold start HD-UDDS
- Warm start HD-UDDS

These driving cycles will be repeated three times for each vehicle.

## Measurements

Core phase level dynamometer bench measurements

- Total hydrocarbon (THC)
- non-methane hydrocarbons (NMHC),
- non-methane organic gas (NMOG),
- oxides of nitrogen (NO<sub>x</sub>),
- nitrogen dioxide (NO<sub>2</sub>),
- carbon monoxide (CO),
- carbon dioxide (CO<sub>2</sub>) and
- gravimetric particulate matter (PM)

Particulates

- Gravimetric mass
- EC/OC
- Particle size distribution, Engine Exhaust Particle Sizer (EEPS).

Speciation

Chassis dynamometer testing shall also generate speciated (speciated VOC) data.

- Volatile organic compound (VOC) compounds of interest include C1 – C12 hydrocarbons as well as light alcohols and carbonyls. (Passivated cans Compendium Method TO-15)
- Carbonyls (TO-11a)
- Oxygenates (CARB method 1001)
- Ethylene Oxide (EtO) (Passivated cans Compendium Method TO-15)

#### Core portable emissions measurement system (PEMS) measurements

- Total hydrocarbon (THC)
- nitrogen oxide (NO)
- oxides of nitrogen (NO<sub>x</sub>)
- nitrogen dioxide (NO<sub>2</sub>)
- carbon monoxide (CO)
- carbon dioxide (CO<sub>2</sub>)

#### Fuel

Fuels will be submitted to OTAQ for analysis.

#### Schedule

##### Phase 1 (Complete)

Source: Ex. 5 Deliberative Process (DP) 2.7L GDI

Fuel: Cert 3 E10

Lab: Light-duty dynamometer facility

Sampling days: 3

Driving schedule: FTP75

Sources: Phase 1 cold start and composite of Phase 2 stabilized with Phase 3 hot start

##### Phase 2 (June 5-12, Complete)

Vehicle: Ex. 5 Deliberative Process (DP) Regular Cab, **Ex. 4 CBI** I-6 6.7L, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There was both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both were tested on each of the 3 days of testing. Each day there was a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans was spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked □ 15 total

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.



Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

After samples have been analyzed at a 10 ppb RL if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high NO<sub>x</sub>, VOCs, CO, CO<sub>2</sub>, or other combustion products) or instrument operational viability becomes compromised. Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1ppb due to the risks involved in pushing the instrumentation past that level are significant.

The total cost for analyzing up to 7 canisters to a 0.10 ppb RL includes the analysis GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

Supplies provided by Enthalpy:

- 18 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 250 cc/min Canister Samplers

Phase 3 (July 8-12)

Vehicle: MY2013 sequential PF

**Ex. 4 CBI**

Fuel: Tier 3 E10 cert fuel

Lab: Light-duty dynamometer facility.

Sampling days: 3

Driving schedules: FTP75 and Supplemental FTP.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting spare).

#### Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds
- 3 controllers set for 505 seconds.
- 10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)
- 9 controllers set for 596 seconds (3 source, 6 background)
- The blank and the outdoor ambient sample do not require controllers.

#### Summary:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Phase 4 (August 26-30)

Vehicle: Turbocharged GDI [ ] (same vehicle as Phase 1).

Fuel: Tier 3 certification fuel (E10)

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

#### Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting the spare).

#### Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

#### Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Phase 5 (September 9-13)

Vehicle: Gasoline heavy-duty truck

Fuel: TBD.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) Two of the hot-start test sample cans will be spiked with EtO prior to sample collection on one day in addition to one that is not spiked. One blank will be taken during the test week.

#### Total Cans Phase 5 –

- 4 - Dilution air background
- 1 - Blank
- 2 - Spikes
- 6 - Cold start HD-UDDS

### 3 - Warm start HD-UDDS

Duration for all canisters is 1060 seconds. The nominal flow rate will be approximately 270 cc/min.

#### Phase 6 (TBD)

Vehicle: Class 8 HDDT per study with James Sanchez

Fuel: ULSD

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

This program includes the EtO sampling of the truck used in a separate study. There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 6 – 6 source, 7 ambient, 1 blank, 1 spiked □ 15 total (not including spare)

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

#### Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, **3@1060** seconds.
- 1 controller/can for each of three days for warm start HD-UDDS, source, **3@1060** seconds
- 1 controllers/cans for stabilized/spiked for the third day, source, **1@1060** seconds
- 2 controllers/cans for background ambient per each of three days, **6@1060** seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

Message

---

**From:** Snow, Richard [Snow.Richard@epa.gov]  
**Sent:** 5/17/2019 6:16:21 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** To remind me to ask or mention about these things on Monday

1. Remember the J1939 data logger.
2. Use the diesel already in the  and grab a sample for OTAQ? Two 1-quart jars?
3. Russell will be on vacation
4. Which test inertia to use for the
5. Need heated filter/sample line/probe for HFID THC. Can probably use part of the sampling system for already in place for the PEUS bench.
6. Where we gonna grab the bkg EtO sample from?
7. Reluctant to use the Horiba BSU bag fill as the trigger for PM and multimedia sampler..fear of blowing something up.
8. I will be here only until 10:00 on May 22. May 28 is a holiday on my CDO so I assume my CDO will be on 5/24/2018. This only leaves 3.5 days left to complete the test cell setup and QA. Likely all QA will not be done by May 28.

**Richard Snow** | Engineering Technician  
U.S. Environmental Protection Agency/ORD/NRMRL/AEMD/DSBB  
109 T.W. Alexander Drive, Mail Drop E343-02  
RTP, NC 27711

Office 919.541.3135 | Cell 919.621.5852  
Snow.Richard@EPA.gov

Message

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**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 5/17/2019 1:06:31 PM  
**To:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**CC:** Shores, Richard [Shores.Richard@epa.gov]  
**Subject:** EtO Test Schedule

After talking with me, Shores proposed:

1. [REDACTED] GDI, normal test conditions completed
2. [REDACTED] diesel, maybe start next week without integrated modal HC data
3. Class 8 diesel, should have integrated modal HC data being recorded
4. PFI, gas, considering the idea of two tests, normal and cold test conditions
5. [REDACTED], GDI, cold test conditions
6. TBD vehicle, possible some pre/post catalyst sampling with canisters only?

Marion amended:

1. [REDACTED], GDI, normal test conditions completed
2. [REDACTED] diesel, maybe start next week without integrated modal HC data
3. Class 8 diesel, should have integrated modal HC data being recorded
4. PFI naturally aspirated, street E0 and E10
5. [REDACTED] GDI, street E0

If they agree, I intend to modify that to move the class 8 HDDT to last. That way the onroad portion of that testing will not delay the rest of the higher priority EtO survey work.

1. [REDACTED] GDI, normal test conditions completed
2. [REDACTED] diesel, maybe start May 28 without integrated modal HC data
3. PFI naturally aspirated, street E0 and Tier 3 Cert E10, June 10-21
4. [REDACTED] GDI, street E0 June 24-28
5. Class 8 diesel, should have integrated modal HC data being recorded (July 15 - ??)

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

Message

---

**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 11/7/2019 2:24:19 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]; Logan, Russ [logan.russ@epa.gov]  
**Subject:** RE: Round 6

Hi Tom,

I just confirmed with Enthalpy that the canister and samplers for Round 6 will be ready for pick up anytime after 10am tomorrow. I'm making arrangements with Russell to pick up the supplies. Do you want to leave them locked up in the white van in E180 over the Veterans Day weekend?

Thanks,

Craig

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
An employee-owned company  
**Contractor to the USEPA**

---

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** Thursday, October 31, 2019 10:52 AM  
**To:** Craig Williams  
**Cc:** Snow, Richard; Faircloth, James  
**Subject:** RE: Round 6

Yes, it will mean that Monday the 18<sup>th</sup> will be a conditioning day and Tuesday the 19<sup>th</sup> will be a sampling day when we will need Daniel.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Thursday, October 31, 2019 10:49 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** RE: Round 6

Hi Tom,  
Below you say that Sampling Days: 4 days.

Does this include the conditioning run? Just wondering because if you do a conditioning run on Tuesday and followed by 4 sampling days that will spill over into the next week and I'll need to confirm Daniel's availability.

Thanks

**Craig Williams**  
Engineer

**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**

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---

**From:** Long, Thomas [Long.Thomas@epa.gov]

**Sent:** Tuesday, October 29, 2019 10:59 AM

**To:** Craig Williams

**Subject:** RE: Round 6

Yes

---

Thomas Long, Mechanical Engineer

Mail Drop E343-02

Building D Room 360

109 T. W. Alexander Drive

Research Triangle Park, NC 27711

Phone: 919-541-3944

---

**From:** Craig Williams <CWilliams@css-inc.com>

**Sent:** Tuesday, October 29, 2019 10:58 AM

**To:** Long, Thomas <Long.Thomas@epa.gov>

**Cc:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>

**Subject:** RE: Round 6

Hi Tom,

i just realized that November 11 is a holiday, Veterans Day. Testing will start November 12 then?

**Craig Williams**

Engineer

**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**

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---

**From:** Long, Thomas [Long.Thomas@epa.gov]

**Sent:** Thursday, October 24, 2019 8:04 AM

**To:** Craig Williams

**Cc:** Snow, Richard; Faircloth, James

**Subject:** Round 6

Round 6 (Nov 11-15)

Vehicle: Turbocharged GDI or, 2.0L I4 engine (150hp) same vehicle as Round 1 and Round 4).

Fuel: Ethanol free fuel from a local station

Lab: Light-duty dynamometer facility.

Sampling days: Four test days.

Each of three days there will be an FTP75. On the fourth day there will be three US06. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and, on the last day, the 596 second – 8.01 mile transient US06.

Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.



- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting the spare).

Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

## Message

**From:** Phelps, Lara [Phelps.Lara@epa.gov]  
**Sent:** 4/17/2019 2:04:54 PM  
**To:** Shores, Richard [Shores.Richard@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** RE: Quick Questions -

Thank you!

-----  
*Lara P. Phelps, Acting Director*

**National Risk Management Research Laboratory, Air and Energy Management Division**  
**U. S. Environmental Protection Agency, Office of Research and Development**  
 109 T.W. Alexander Drive (E343-04), Research Triangle Park, NC 27711  
 Office: 919-541-5544 | Cell: 984-287-0594 | Email: phelps.lara@epa.gov

-----  
**From:** Shores, Richard  
**Sent:** Wednesday, April 17, 2019 9:59 AM  
**To:** Phelps, Lara <Phelps.Lara@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** RE: Quick Questions -

Lara,

1. The   a GDI, spark ignition(gas powered)
2. Analytes(regulated) are those defined in 40CFR, Parts 1065 and 1066 ( NOx, Total HC, Methane, CO, CO2, PM2.5 and Particle counts) and required for vehicle certification.
3. Analytes(non-regulated) include ethanol, Carbonyls and VOC/SVOC included in a TO-15 sample analysis.
4. EtO testing is also conducted using the TO-15 sampling method, delivered to a contractor for analysis.
5. Routine Dyno testing is conducted every 1-3 months
6. The last I heard, the contractor will deliver their results in a month?
7. There was a QA audit conducted yesterday in the Dyno facility and QA will review the data before it is released to the OTAQ staff.
8. Final release of data is unclear, at least a month, need to make sure that all of the equipment was performing properly.
9. OTAQ EPA staff involved include: Marion Hoyer, Rich Cook, Justine Geidosch, Chris Laroo, Angeline Cullen and Michael Olechiw. These people were involved in the planning and preparation for the testing, including how the results will be presented.

Richard Shores

-----  
**From:** Phelps, Lara  
**Sent:** Wednesday, April 17, 2019 8:11 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>  
**Subject:** Quick Questions -

Hi Tom, Richard, and James!

Alice is asking me some questions this morning. Can you fill-in the blanks for me?

Thanks!

Lara

The Ex. 5 Deliberative Process (DP) truck has a diesel engine? What analytes do we look at for the standard routine testing? How often do we routinely test? Is there a schedule for when we would provide the data to OTAQ after QA review? What method(s) is being used to sample for EtO? What EPA staff are involved again?

---

*Lara P. Phelps, Acting Director*

**National Risk Management Research Laboratory, Air and Energy Management Division**

**U. S. Environmental Protection Agency, Office of Research and Development**

109 T.W. Alexander Drive (E343-04), Research Triangle Park, NC 27711

Office: 919-541-5544 | Cell: 984-287-0594 | Email: [phelps.lara@epa.gov](mailto:phelps.lara@epa.gov)

Message

---

**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 4/15/2019 8:36:02 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]; Snow, Richard [Snow.Richard@epa.gov]  
**CC:** Logan, Russ [logan.russ@epa.gov]; Janek, Daniel [Janek.Daniel@epa.gov]  
**Subject:** FW: Enthalpy EO Quote

Hi All,  
Here is a link for the Enthalpy chain of custody.

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Friday, April 12, 2019 3:59 PM  
**To:** Craig Williams  
**Subject:** RE: Enthalpy EO Quote

COC link: <http://montrose-env.com/wp-content/uploads/2018/01/Chain-of-Custody-ENV-1.pdf>

*Please take a moment to provide [customer feedback](#).*



**Bryan Tyler**  
Vice President  
Enthalpy Analytical, LLC  
800 Capitola Drive, Suite 1  
Durham, NC 27713  
(919) 850-4392  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)  
[www.enthalpy.com](http://www.enthalpy.com)

[Terms and Conditions](#)  
[Enthalpy Sample Acceptance Policy](#)

SSAS Laboratory ID: L0036, L0149 (metals only)

---

**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Friday, April 12, 2019 3:55 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>; Bryan Tyler

[<bryan.tyler@enthalpy.com>](mailto:bryan.tyler@enthalpy.com)

**Subject:** RE: Enthalpy EO Quote

Hi Tom,  
Enthalpy confirmed receipt of the POs from Jacobs yesterday. I just checked in with Bryan and he will send me an email update and copy you.

I have Daniel Janek lined up to help out next week.

Thanks

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Long, Thomas [[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)]  
**Sent:** Wednesday, April 10, 2019 7:11 AM  
**To:** Craig Williams  
**Cc:** Snow, Richard; Faircloth, James; Bryan Tyler  
**Subject:** FW: Enthalpy EO Quote

Craig,

I won't bore you with the details of why this is coming back to you so last minute, but we're going to need JACOBS positioned to place this PR with Enthalpy as soon as I get confirmation that we have received the funding on our work assignment from the program office. Frankly, I thought that would happen yesterday and now I'm hoping for today. (I see an email flurry indicating that it is in process!) To make matters worse we want to have the cans here Friday (or Monday at the latest). If you and Bryan could get whatever paperwork in place you need so that when I signal we can set things in motion I would appreciate it. The lab has a conflicting commitment the week after next so it is important that we get this testing done next week.

Of course, I am currently in training that only occurs once a year. Craig, if you need to reach me during training please text me. I will be checking with the CO when they give us breaks.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Bryan Tyler [<bryan.tyler@enthalpy.com>](mailto:bryan.tyler@enthalpy.com)  
**Sent:** Monday, April 08, 2019 12:04 PM  
**To:** Long, Thomas [<Long.Thomas@epa.gov>](mailto:Long.Thomas@epa.gov)  
**Cc:** Thorne Gregory [<thorne.gregory@enthalpy.com>](mailto:thorne.gregory@enthalpy.com)  
**Subject:** Enthalpy EO Quote

Dear Thomas,

As discussed you would like to engage Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0219-074). Samples will be collected into individually blank checks 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode.

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Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1ppb due to the risks involved in pushing the instrumentation past that level are significant.

In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10 ppb reporting limit and by EPA Method 3C (O<sub>2</sub>, CO<sub>2</sub>, Methane, CO) with a 0.10% reporting limit. See attached TO-15 target compound list.

## Ex. 4 CBI

Please let me know ASAP if you will be moving forward with this project.

Kind Regards,  
Bryan

*Please take a moment to provide customer feedback.*



**Bryan Tyler**

Vice President  
Enthalpy Analytical, LLC  
800 Capitola Drive, Suite 1  
Durham, NC 27713  
(919) 850-4392  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)  
[www.enthalpy.com](http://www.enthalpy.com)

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Message

---

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 4/15/2019 12:29:52 PM  
**To:** Craig Williams [CWilliams@css-inc.com]; Janek, Daniel [Janek.Daniel@epa.gov]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** RE: Enthalpy EO Quote

Happy to meet with him for a few minutes anytime today.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Friday, April 12, 2019 4:12 PM  
**To:** Janek, Daniel <Janek.Daniel@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** FW: Enthalpy EO Quote

Hi Daniel,  
Sample COC for SUMMAs in email link.

Tom,  
Do you feel you'll should meet with Daniel Monday to run through his responsibilities? Concerned you guys will be busy prepping Tuesday.

Thanks

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
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---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Friday, April 12, 2019 3:59 PM  
**To:** Craig Williams  
**Subject:** RE: Enthalpy EO Quote

COC link: <http://montrose-env.com/wp-content/uploads/2018/01/Chain-of-Custody-ENV-1.pdf>

*Please take a moment to provide customer feedback.*





**Bryan Tyler**

Vice President  
Enthalpy Analytical, LLC  
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---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Sent:** Friday, April 12, 2019 3:55 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Snow, Richard <[Snow.Richard@epa.gov](mailto:Snow.Richard@epa.gov)>; Faircloth, James <[Faircloth.James@epa.gov](mailto:Faircloth.James@epa.gov)>; Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Subject:** RE: Enthalpy EO Quote

Hi Tom,  
Enthalpy confirmed receipt of the POs from Jacobs yesterday. I just checked in with Bryan and he will send me an email update and copy you.

I have Daniel Janek lined up to help out next week.

Thanks

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
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**Cc:** Snow, Richard; Faircloth, James; Bryan Tyler  
**Subject:** FW: Enthalpy EO Quote

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things in motion I would appreciate it. The lab has a conflicting commitment the week after next so it is important that we get this testing done next week.

Of course, I am currently in training that only occurs once a year. Craig, if you need to reach me during training please text me. I will be checking with the CO when they give us breaks.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
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Research Triangle Park, NC 27711  
Phone: 919-541-3944

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**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Sent:** Monday, April 08, 2019 12:04 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>  
**Subject:** Enthalpy EO Quote

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## Ex. 4 CBI

Please let me know ASAP if you will be moving forward with this project.

Kind Regards,  
Bryan

*Please take a moment to provide customer feedback.*



**Bryan Tyler**

Vice President

Enthalpy Analytical, LLC

800 Capitola Drive, Suite 1

Durham, NC 27713

(919) 850-4392

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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Message

---

**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 4/10/2019 1:58:35 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]; Bryan Tyler [bryan.tyler@enthalpy.com]  
**Subject:** RE: Enthalpy EO Quote

Hi Tom,  
I'm working on setting things up with Jacobs in case this all comes together.

Brian,  
I just left a voicemail and would like to talk to you when you have a minute.

Thanks,

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

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**Sent:** Wednesday, April 10, 2019 7:11 AM  
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**Cc:** Snow, Richard; Faircloth, James; Bryan Tyler  
**Subject:** FW: Enthalpy EO Quote

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Of course, I am currently in training that only occurs once a year. Craig, if you need to reach me during training please text me. I will be checking with the CO when they give us breaks.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

**From:** Bryan Tyler <bryan.tyler@enthalpy.com>  
**Sent:** Monday, April 08, 2019 12:04 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Thorne Gregory <thorne.gregory@enthalpy.com>  
**Subject:** Enthalpy EO Quote

Dear Thomas,

As discussed you would like to engage Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0219-074). Samples will be collected into individually blank checks 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode.

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## Ex. 4 CBI

Please let me know ASAP if you will be moving forward with this project.

Kind Regards,  
Bryan

*Please take a moment to provide customer feedback.*



**Bryan Tyler**  
Vice President  
Enthalpy Analytical, LLC  
800 Capitola Drive, Suite 1  
Durham, NC 27713  
(919) 850-4392  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)  
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Message

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** 4/10/2019 11:15:04 AM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Craig Williams [CWilliams@css-inc.com]; Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** Re: Enthalpy EO Quote

This helps a lot

Is testing being done in RTP?

On Wed, Apr 10, 2019, 7:12 AM Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)> wrote:

Bryan, we start the tests at 6:00 am on Tuesday, Wednesday, and Thursday, allowing Friday as a makeup in case we have a problem with one of our test days.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Sent:** Wednesday, April 10, 2019 7:10 AM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Subject:** Re: Enthalpy EO Quote

It's going to be difficult to have everything ready by then...what would the sampling schedule be?

On Wed, Apr 10, 2019, 6:44 AM Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)> wrote:

Yes, it is in E-building at RTP.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Sent:** Tuesday, April 09, 2019 12:56 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Subject:** RE: Enthalpy EO Quote

Is this sampling local?

*Please take a moment to provide customer feedback.*

**Bryan Tyler**  
Vice President  
Enthalpy Analytical, LLC  
800 Capitola Drive, Suite 1  
Durham, NC 27713  
(919) 850-4392  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)  
[www.enthalpy.com](http://www.enthalpy.com)

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SSAS Laboratory ID: L0036, L0149 (metals only)

---

**From:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Sent:** Tuesday, April 9, 2019 12:47 PM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Subject:** RE: Enthalpy EO Quote

Either this Friday or first thing Monday morning.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02



Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Sent:** Tuesday, April 09, 2019 12:45 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>; Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Subject:** RE: Enthalpy EO Quote

Thomas,  
Thank you for the update. If this moves forward when would you like to have equipment in hand?

Best,  
Bryan

*Please take a moment to provide customer feedback.*

**Bryan Tyler**  
Vice President  
Enthalpy Analytical, LLC  
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Durham, NC 27713  
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**From:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Sent:** Tuesday, April 9, 2019 12:35 PM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>; Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Subject:** RE: Enthalpy EO Quote

Bryan,

In yet another twist, the program office has decided to write the PR on our contract with Jacobs. So we'll be back to working with Craig if and when that PR comes through. I'm not counting my chickens, but I do hope to know something by tomorrow. I should have known nothing would be as straightforward as it was originally presented!

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

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**Sent:** Monday, April 08, 2019 1:44 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Subject:** RE: Enthalpy EO Quote

Thank you Thomas.

*Please take a moment to provide customer feedback.*

**Bryan Tyler**  
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**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>

**Subject:** RE: Enthalpy EO Quote

Bryan,

Thank you for the quote. I have forwarded it to the program office. If they find the terms agreeable, you should be hearing directly from them in short order.

---

Thomas Long, Mechanical Engineer

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## Ex. 4 CBI

Please let me know ASAP if you will be moving forward with this project.

Kind Regards,  
Bryan

*Please take a moment to provide customer feedback.*

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Vice President  
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SSAS Laboratory ID: L0036, L0149 (metals only)

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Message

---

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 4/10/2019 11:12:49 AM  
**To:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**CC:** Craig Williams [CWilliams@css-inc.com]; Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** RE: Enthalpy EO Quote

Bryan, we start the tests at 6:00 am on Tuesday, Wednesday, and Thursday, allowing Friday as a makeup in case we have a problem with one of our test days.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

**From:** Bryan Tyler <bryan.tyler@enthalpy.com>  
**Sent:** Wednesday, April 10, 2019 7:10 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** Re: Enthalpy EO Quote

It's going to be difficult to have everything ready by then...what would the sampling schedule be?

On Wed, Apr 10, 2019, 6:44 AM Long, Thomas <Long.Thomas@epa.gov> wrote:

Yes, it is in E-building at RTP.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Bryan Tyler <bryan.tyler@enthalpy.com>  
**Sent:** Tuesday, April 09, 2019 12:56 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** RE: Enthalpy EO Quote

Is this sampling local?

*Please take a moment to provide customer feedback.*



**Bryan Tyler**

Vice President

Enthalpy Analytical, LLC

800 Capitola Drive, Suite 1

Durham, NC 27713

(919) 850-4392

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

[www.enthalpy.com](http://www.enthalpy.com)

[Terms and Conditions](#)

[Enthalpy Sample Acceptance Policy](#)

SSAS Laboratory ID: L0036, L0149 (metals only)

---

**From:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>

**Sent:** Tuesday, April 9, 2019 12:47 PM

**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Subject:** RE: Enthalpy EO Quote

Either this Friday or first thing Monday morning.

---

Thomas Long, Mechanical Engineer

Mail Drop E343-02

Building D Room 360

109 T. W. Alexander Drive

Research Triangle Park, NC 27711

Phone: 919-541-3944

---

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Sent:** Tuesday, April 09, 2019 12:45 PM

**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>

**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>; Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>

**Subject:** RE: Enthalpy EO Quote

Thomas,

Thank you for the update. If this moves forward when would you like to have equipment in hand?

Best,

Bryan

*Please take a moment to provide customer feedback.*

**Bryan Tyler**

Vice President

Enthalpy Analytical, LLC

800 Capitola Drive, Suite 1

Durham, NC 27713

(919) 850-4392

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

[www.enthalpy.com](http://www.enthalpy.com)

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---

**From:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>

**Sent:** Tuesday, April 9, 2019 12:35 PM

**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>; Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>

**Subject:** RE: Enthalpy EO Quote

Bryan,

In yet another twist, the program office has decided to write the PR on our contract with Jacobs. So we'll be back to working with Craig if and when that PR comes through. I'm not counting my chickens, but I do hope to know something by tomorrow. I should have known nothing would be as straightforward as it was originally presented!



---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Sent:** Monday, April 08, 2019 1:44 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Subject:** RE: Enthalpy EO Quote

Thank you Thomas.

*Please take a moment to provide customer feedback.*

**Bryan Tyler**

Vice President  
Enthalpy Analytical, LLC  
800 Capitola Drive, Suite 1  
Durham, NC 27713  
(919) 850-4392  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)  
[www.enthalpy.com](http://www.enthalpy.com)

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[Enthalpy Sample Acceptance Policy](#)

SSAS Laboratory ID: L0036, L0149 (metals only)

---

**From:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Sent:** Monday, April 8, 2019 12:50 PM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>

**Subject:** RE: Enthalpy EO Quote

Bryan,

Thank you for the quote. I have forwarded it to the program office. If they find the terms agreeable, you should be hearing directly from them in short order.

---

Thomas Long, Mechanical Engineer

Mail Drop E343-02

Building D Room 360

109 T. W. Alexander Drive

Research Triangle Park, NC 27711

Phone: 919-541-3944

---

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Sent:** Monday, April 08, 2019 12:04 PM

**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>

**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>

**Subject:** Enthalpy EO Quote

Dear Thomas,

As discussed you would like to engage Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0219-074). Samples will be collected into individually blank checks 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode.

We anticipate analyzing approximately 15 canisters collected from active combustion sources at a significant dilution with an expected reporting limit (RL) of 10ppb. After all samples have been analyzed at the first dilution (10 ppb RL), if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high CO/CO<sub>2</sub>, combustion products) or instrument operational viability becomes compromised.

Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1ppb due to the risks involved in pushing the instrumentation past that level are significant.

In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10 ppb reporting limit and by EPA Method 3C (O<sub>2</sub>, CO<sub>2</sub>, Methane, CO) with a 0.10% reporting limit. See attached TO-15 target compound list.

# Ex. 4 CBI

Please let me know ASAP if you will be moving forward with this project.

Kind Regards,

Bryan

*Please take a moment to provide customer feedback.*

Customer Feedback Form

**Bryan Tyler**

Vice President

Enthalpy Analytical, LLC

800 Capitola Drive, Suite 1

Durham, NC 27713

(919) 850-4392

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

[www.enthalpy.com](http://www.enthalpy.com)

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7/11/2019

Phase 4 - 10 ppb Quote

**Phase 4 - 10 ppb Quote**

Bryan Tyler [bryan.tyler@enthalpy.com]

Sent: Friday, May 24, 2019 12:03 PM

To: Craig Williams

Cc: David Berkowitz [David.Berkowitz@enthalpy.com]; Thorne Gregory [Thorne.Gregory@enthalpy.com]

Hi Craig,

See proposal for Phase 4 10ppb.

**Phase 4 Scope:**

Turbocharged GDI [REDACTED] (same vehicle as Phase 1). E0 fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 4 – 9 source, 13 ambient, 1 blank, 1 spiked -&gt; 24 total

1 controller per day for cold start, source, 505 seconds.

1 controller for each of two days for stabilized, source, 1372 seconds

2 controllers for stabilized/spiked for the third day, source, 1372 seconds

1 controller per day for source, US06, 600 seconds.

2 controllers for background ambient per day, 1372 seconds

2 controllers per day for background ambient for 600 seconds

**Enthalpy Proposal, 10 ppb:**

Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, EPA Method TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Scan mode.

We anticipate analyzing approximately 24 canisters collected from active combustion sources at a 20x dilution with an expected reporting limit (RL) of 10ppb. In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10ppb reporting limit, and by EPA Method 3C (O2, CO2, Methane, CO) with a 0.10% reporting limit.

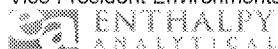
The total cost for this project is [REDACTED] which includes the analysis of up to 24 canisters at a 10 ppb RL. Included is a GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

**Supplies to be ready on 6/20/2019:***Supplies provided by Enthalpy:*

- 28 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 550 cc/min Canister Samplers
- 5 x 200 cc/min Canister Samplers

Bryan Tyler

Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713

O: 919.850.4392 x12203 | M: 919.491.5145

bryan.tyler@enthalpy.com

*To help protect the air we breathe, the water we drink, and the soil that feeds us.*

**Please take a moment to provide *customer feedback***

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7/11/2019

Phase 4 - 0.1 ppb Quote

**Phase 4 - 0.1 ppb Quote**

Bryan Tyler [bryan.tyler@enthalpy.com]

Sent: Friday, May 24, 2019 12:07 PM

To: Craig Williams

Cc: David Berkowitz [David.Berkowitz@enthalpy.com]; Thorne Gregory [Thorne.Gregory@enthalpy.com]

Hi Craig,

See proposal for Phase 4 0.1ppb.

**Phase 4 Scope:**

Turbocharged GDI [REDACTED] same vehicle as Phase 1). E0 fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 4 – 9 source, 13 ambient, 1 blank, 1 spiked -&gt; 24 total

1 controller per day for cold start, source, 505 seconds.

1 controller for each of two days for stabilized, source, 1372 seconds

2 controllers for stabilized/spiked for the third day, source, 1372 seconds

1 controller per day for source, US06, 600 seconds.

2 controllers for background ambient per day, 1372 seconds

2 controllers per day for background ambient for 600 seconds

**Enthalpy Proposal, 0.1 ppb:**

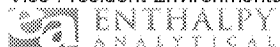
Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM). After samples have been analyzed at a 10 ppb RL if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high NOx, VOCs, CO, CO2, or other combustion products) or instrument operational viability becomes compromised. Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1 ppb due to the risks involved in pushing the instrumentation past that level are significant. The total cost for analyzing up to 10 canisters to a 0.1 ppb RL is [REDACTED] which includes the analysis GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

**Supplies to be ready on 6/20/2019:***Supplies provided by Enthalpy:*

- 28 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 550 cc/min Canister Samplers
- 5 x 200 cc/min Canister Samplers

Bryan Tyler

Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713

O: 919.850.4392 x12203 | M: 919.491.5145

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)*To help protect the air we breathe, the water we drink, and the soil that feeds us.**Please take a moment to provide customer feedback*Terms and Conditions & Enthalpy Sample Acceptance Policy.

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## Message

**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 6/19/2019 6:25:26 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** RE: Phases 3 & 4

Hi Tom,  
 Thanks for your reply. I sent your comment to Enthalpy.

Craig

**Craig Williams**  
 Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
 An employee-owned company  
 Contractor to the USEPA

---

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** Wednesday, June 19, 2019 12:39 PM  
**To:** Craig Williams  
**Cc:** Snow, Richard; Faircloth, James  
**Subject:** RE: Phases 3 & 4

For Phase 3 (Delivered Monday the 8<sup>th</sup> for sampling July 8-12), the number of cans looks right. The number of 1400 cc/min is given as 10 instead of 12. We need 12. The number of 550 cc/min controllers is given as 12 and we need 10.

For Phase 4 (Delivered Friday the 21<sup>st</sup> for sampling July 24-28), the same changes have to be made.

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Tuesday, June 18, 2019 11:03 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** FW: Phases 3 & 4  
**Importance:** High

Hi Tom,  
 Enthalpy needs to change to 15L canister and provided updated controller flows. Please review the flows, times, number of controllers, number of canisters, and the delivery dates below.

Is everything acceptable?

Craig

**Craig Williams**  
 Engineer

**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**

An employee-owned company

Contractor to the USEPA

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]

**Sent:** Tuesday, June 18, 2019 9:03 AM

**To:** Craig Williams

**Cc:** Thorne Gregory; David Berkowitz

**Subject:** Phases 3 & 4

Craig,

See below orders, please note for phases 3 & 4 we will be using ambient Silco lined 15L canisters, with this job pushing to July we had to change the canisters size due to availability. Controller flows have also been changed to allow for your specified collection durations. Please review and confirm the below orders:

IMPORTANT: The same controllers/samplers will be used week of 7/8 & 7/15, we request that at the end of each day during Phase 3 the used controllers be delivered to Enthalpy for cleaning so they can be ready for the Phase 4 order.

Phase To be ready for delivery on Monday 7/8:

- 28 x 15L Silco canisters (batch 0.05 ppb TO-15)
- 12 x Soil Gas Samplers @ 550 cc/min - 1372 seconds (individual 0.05 ppb TO-15)
- 10 x Soil Gas Samplers @ 1400 cc/min - 505-600 seconds (individual 0.05 ppb TO-15)

To be ready for delivery on Monday 7/15:

- 28 x 15L Silco canisters (batch 0.05 ppb TO-15)
- 12 x Soil Gas Samplers @ 550 cc/min - 1372 seconds (individual 0.05 ppb TO-15)
- 10 x Soil Gas Samplers @ 1400 cc/min - 505-600 seconds (individual 0.05 ppb TO-15)

Bryan Tyler

VP Environmental Laboratory Services

800-1 Capitola Dr., Durham, NC 27713

O: 919.850.4392 x12203 | M: 919.491.5145

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>

**Sent:** Tuesday, June 11, 2019 8:48 AM

**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; David Berkowitz <[David.Berkowitz@enthalpy.com](mailto:David.Berkowitz@enthalpy.com)>

**Subject:** RE: Phase 3 - 10 ppb Quote

Hi Bryan,

Yes, EPA would like 22 controllers for both phases, 3 and 4.

Craig

**Craig Williams**

Engineer

**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**

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---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Monday, June 10, 2019 11:03 AM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; David Berkowitz  
**Subject:** RE: Phase 3 - 10 ppb Quote

Craig,

With this not happening until July we should be good...do the below controllers needs represent what is needed for Phase 3 & 4?

Bryan Tyler  
 VP Environmental Laboratory Services

800-1 Capitola Dr., Durham, NC 27713  
 O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Sent:** Friday, June 7, 2019 10:22 AM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; David Berkowitz <[David.Berkowitz@enthalpy.com](mailto:David.Berkowitz@enthalpy.com)>  
**Subject:** RE: Phase 3 - 10 ppb Quote

Hi Bryan,  
 EPA has decided to postpone the start date for Phase 3 testing until the week of July 8 and would like to plan on delivery of the cans on Monday, July 8.

Please see EPA's comments regarding the number of controllers below. I also think he missed the spare when counting the cans because I get 25 cans not 24 but that's Ok since your quote was for 28 cans. Can you prove the number of controllers he requested?

The Enthalpy quote looks good except the number of canister samplers. I do not want to reuse controllers for fear of possible cross-contamination:

24 cans => 22 controllers (3@505s+2@1372s+2@1372s+3@600s+6@1372s+6@600s)

Based on:

- 1 controller/can per each of **three** days for cold start, source, 3@505 seconds.
- 1 controller/can for each of **two** days for stabilized, source, 2@1372 seconds
- x2** controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of **three** days for source, US06, 3@600 seconds.
- 2 controllers/cans for background ambient per each of **three** days, 6@1372 seconds
- 2 controllers/cans per each of **three** days for background ambient for 6@600 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

**Craig Williams**  
 Engineer

**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**

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---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Friday, May 24, 2019 11:48 AM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; David Berkowitz  
**Subject:** Phase 3 - 10 ppb Quote

Hi Craig,  
See proposal for Phase 3 10ppb.

**Phase 3 Scope:**

Naturally aspirated PFI light-duty vehicle, E10 cert fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 3 – 9 source, 13 ambient, 1 blank, 1 spike -> 24 total  
1 controller per day for cold start, source, 505 seconds.  
1 controller for each of two days for stabilized, source, 1372 seconds  
2 controllers for stabilized/spiked for the third day, source, 1372 seconds  
1 controller per day for source, US06, 600 seconds.  
2 controllers for background ambient per day, 1372 seconds  
2 controllers per day for background ambient for 600 seconds

**Enthalpy Proposal, 10 ppb:**

Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, EPA Method TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Scan mode.

We anticipate analyzing approximately 24 canisters collected from active combustion sources at a 20x dilution with an expected reporting limit (RL) of 10ppb. In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10ppb reporting limit, and by EPA Method 3C (O2, CO2, Methane, CO) with a 0.10% reporting limit.

The total cost for this project is Ex. 1 Deliberative Process (DP) which includes the analysis of up to 24 canisters at a 10 ppb RL. Included is a GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

**Supplies to be ready on 6/13/2019:**

*Supplies provided by Enthalpy:*

- 28 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 550 cc/min Canister Samplers
- 5 x 200 cc/min Canister Samplers

Bryan Tyler  
Vice President Environmental

800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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Message

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**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 6/19/2019 4:39:18 PM  
**To:** Craig Williams [CWilliams@css-inc.com]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** RE: Phases 3 & 4

For Phase 3 (Delivered Monday the 8<sup>th</sup> for sampling July 8-12), the number of cans looks right. The number of 1400 cc/min is given as 10 instead of 12. We need 12. The number of 550 cc/min controllers is given as 12 and we need 10.

For Phase 4 (Delivered Friday the 21<sup>st</sup> for sampling July 24-28), the same changes have to be made.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Tuesday, June 18, 2019 11:03 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** FW: Phases 3 & 4  
**Importance:** High

Hi Tom,  
Enthalpy needs to change to 15L canister and provided updated controller flows. Please review the flows, times, number of controllers, number of canisters, and the delivery dates below.

Is everything acceptable?

Craig

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
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---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Tuesday, June 18, 2019 9:03 AM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; David Berkowitz  
**Subject:** Phases 3 & 4

Craig,  
See below orders, please note for phases 3 & 4 we will be using ambient Silco lined 15L canisters, with this job pushing to July we had to change the canisters size due to availability. Controller flows have also been changed to allow for your specified collection durations. Please review and confirm the below orders:

IMPORTANT: The same controllers/samplers will be used week of 7/8 & 7/15, we request that at the end of each day during Phase 3 the used controllers be delivered to Enthalpy for cleaning so they can be ready for the Phase 4 order.

Phase To be ready for delivery on Monday 7/8:

- 28 x 15L Silco canisters (batch 0.05 ppb TO-15)
- 12 x Soil Gas Samplers @ 550 cc/min - 1372 seconds (individual 0.05 ppb TO-15)
- 10 x Soil Gas Samplers @ 1400 cc/min - 505-600 seconds (individual 0.05 ppb TO-15)

To be ready for delivery on Monday 7/15:

- 28 x 15L Silco canisters (batch 0.05 ppb TO-15)
- 12 x Soil Gas Samplers @ 550 cc/min - 1372 seconds (individual 0.05 ppb TO-15)
- 10 x Soil Gas Samplers @ 1400 cc/min - 505-600 seconds (individual 0.05 ppb TO-15)

Bryan Tyler  
VP Environmental Laboratory Services



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[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

*To help protect the air we breathe, the water we drink, and the soil that feeds us.*

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**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Sent:** Tuesday, June 11, 2019 8:48 AM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; David Berkowitz <[David.Berkowitz@enthalpy.com](mailto:David.Berkowitz@enthalpy.com)>  
**Subject:** RE: Phase 3 - 10 ppb Quote

Hi Bryan,  
Yes, EPA would like 22 controllers for both phases, 3 and 4.

Craig

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
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---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Monday, June 10, 2019 11:03 AM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; David Berkowitz  
**Subject:** RE: Phase 3 - 10 ppb Quote

Craig,  
With this not happening until July we should be good...do the below controllers needs represent what is needed for Phase 3 & 4?

Bryan Tyler  
VP Environmental Laboratory Services

800-1 Capitola Dr., Durham, NC 27713  
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---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Sent:** Friday, June 7, 2019 10:22 AM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; David Berkowitz <[David.Berkowitz@enthalpy.com](mailto:David.Berkowitz@enthalpy.com)>  
**Subject:** RE: Phase 3 - 10 ppb Quote

Hi Bryan,  
EPA has decided to postpone the start date for Phase 3 testing until the week of July 8 and would like to plan on delivery of the cans on Monday, July 8.

Please see EPA's comments regarding the number of controllers below. I also think he missed the spare when counting the cans because I get 25 cans not 24 but that's Ok since your quote was for 28 cans. Can you prove the number of controllers he requested?

The Enthalpy quote looks good except the number of canister samplers. I do not want to reuse controllers for fear of possible cross-contamination:

24 cans => 22 controllers (3@505s+2@1372s+2@1372s+3@600s+6@1372s+6@600s)

Based on:

- 1 controller/can per each of **three** days for cold start, source, 3@505 seconds.
- 1 controller/can for each of **two** days for stabilized, source, 2@1372 seconds
- x2** controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of **three** days for source, US06, 3@600 seconds.
- 2 controllers/cans for background ambient per each of **three** days, 6@1372 seconds
- 2 controllers/cans per each of **three** days for background ambient for 6@600 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

**Craig Williams**  
Engineer

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---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Friday, May 24, 2019 11:48 AM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; David Berkowitz  
**Subject:** Phase 3 - 10 ppb Quote

Hi Craig,  
See proposal for Phase 3 10ppb.

**Phase 3 Scope:**

Naturally aspirated PFI light-duty vehicle, E10 cert fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 3 – 9 source, 13 ambient, 1 blank, 1 spike -> 24 total

1 controller per day for cold start, source, 505 seconds.

1 controller for each of two days for stabilized, source, 1372 seconds

2 controllers for stabilized/spiked for the third day, source, 1372 seconds

1 controller per day for source, US06, 600 seconds.

2 controllers for background ambient per day, 1372 seconds

2 controllers per day for background ambient for 600 seconds

#### **Enthalpy Proposal, 10 ppb:**

Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, EPA Method TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Scan mode.

We anticipate analyzing approximately 24 canisters collected from active combustion sources at a 20x dilution with an expected reporting limit (RL) of 10ppb. In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10ppb reporting limit, and by EPA Method 3C (O<sub>2</sub>, CO<sub>2</sub>, Methane, CO) with a 0.10% reporting limit.

The total cost for this project is Ex. 1 Deliberative Process ON which includes the analysis of up to 24 canisters at a 10 ppb RL. Included is a GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

#### **Supplies to be ready on 6/13/2019:**

##### *Supplies provided by Enthalpy:*

- 28 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 550 cc/min Canister Samplers
- 5 x 200 cc/min Canister Samplers

Bryan Tyler

Vice President Environmental



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[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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Message

---

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 6/13/2019 5:00:15 PM  
**To:** Williams, Craig [williams.craig@epa.gov]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** 2019 EtO Project Plan and Testing Overview.docx  
**Attachments:** 2019 EtO Project Plan and Testing Overview.docx

Craig,

The attached document is not to be considered as direction, but is provided for your information. The last section includes an aspirational schedule which I have summarized below.

Phase 1		0 (complete)
Phase 2		SD (complete)
Phase 3		E10 July 8-12
Phase 4		(July 24-28)
Phase 5	HDGT Fuel TBD (August)	
Phase 6	Class 8 HDDT ULSD (Schedule TBD)	

**Title**

Mobile Source Ethylene Oxide (EtO) Emissions Measurement and Characterization

**Vehicles**

- 2016 Ex. 5 Deliberative Process (DP) with 5,570 miles on a 2.7 L turbocharged wall-guided GDI
- 2011 Ex. 5 Deliberative Process (DP) with NNNN miles on a 6.7L heavy-duty diesel truck (HDDT) equipped with EGR, DPF, SCK, and DOC.
- A heavy-duty spark ignition vehicle
- Template: YYYY Make Model with NNNN miles on a NN liter <turbocharged|naturally aspirated><PFI|Diesel|GDI>

Vehicles were selected at the request of the Office of Transportation and Air Quality (OTAQ).

**Chassis Dynamometer Driving Schedules**

The light-duty vehicles were/will be tested at an ambient temperature of 72 °F (22 °C).

- [ [HYPERLINK "http://www.epa.gov/otaq/emisslab/methods/huddscol.txt"](http://www.epa.gov/otaq/emisslab/methods/huddscol.txt) ] (FTP)
- The Supplemental FTP (SFTP) also known as US06

The heavy-duty vehicles were/will be tested in the laden condition (90% GCWR).

- Cold start HD-UDDS
- Warm start HD-UDDS

These driving cycles will be repeated three times for each vehicle.

**Measurements**

Core phase level dynamometer bench measurements

- Total hydrocarbon (THC)
- non-methane hydrocarbons (NMHC),
- non-methane organic gas (NMOG),
- oxides of nitrogen (NO<sub>x</sub>),
- nitrogen dioxide (NO<sub>2</sub>),
- carbon monoxide (CO),
- carbon dioxide (CO<sub>2</sub>) and
- gravimetric particulate matter (PM)

Particulates

- Gravimetric mass
- EC/OC
- Particle size distribution, Engine Exhaust Particle Sizer (EEPS).

Speciation

Chassis dynamometer testing shall also generate speciated (speciated VOC) data.

- Volatile organic compound (VOC) compounds of interest include C1 – C12 hydrocarbons as well as

light alcohols and carbonyls. (Passivated cans Compendium Method TO-15)

- Carbonyls (TO-11a)
- Oxygenates (CARB method 1001)
- Ethylene Oxide (EtO) (Passivated cans Compendium Method TO-15)

#### Core portable emissions measurement system (PEMS) measurements

- Total hydrocarbon (THC)
- nitrogen oxide (NO)
- oxides of nitrogen (NO<sub>x</sub>)
- nitrogen dioxide (NO<sub>2</sub>)
- carbon monoxide (CO)
- carbon dioxide (CO<sub>2</sub>)

#### Fuel

Fuels will be submitted to OTAQ for analysis.

#### Schedule

##### Phase 1 (Complete)

Source: **Ex. 5 Deliberative Process (DP)**

Fuel: Cert 3 E10

Lab: Light-duty dynamometer facility

Sampling days: 3

Driving schedule: FTP75

Sources: Phase 1 cold start and composite of Phase 2 stabilized with Phase 3 hot start

##### Phase 2 (June 5-12, Complete)

Vehicle: **Ex. 5 Deliberative Process (DP)**, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There was both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both were tested on each of the 3 days of testing. Each day there was a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans was spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked □ 15 total

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

### Phase 3 (July 8-12)

Vehicle: A common naturally aspirated PFI light-duty vehicle, e.g.,

Fuel: Tier 3 E10 cert fuel

Lab: Light-duty dynamometer facility.

Sampling days: 3

Driving schedules: FTP75 and Supplemental FTP.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

#### Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting spare).

#### Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds
- 3 controllers set for 505 seconds.
- 10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)
- 9 controllers set for 596 seconds (3 source, 6 background)
- The blank and the outdoor ambient sample do not require controllers.

#### Summary:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background

- 1 can for blank
- 1 spare

#### Phase 4 (July 24-28)

Vehicle: Turbocharged GDI  (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel (ethanol free) or market E0 fuel

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

#### Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting the spare).

#### Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

#### Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds

- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Phase 5 (August 12-16)

Vehicle: Gasoline heavy-duty diesel

Fuel: TBD.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 5 – 6 source, 7 ambient, 1 blank, 1 spiked □ 15 total (not including spare)

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

#### Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@1060 seconds.
- 1 controller/can for each of three days for warm start HD-UDDS, source, 3@1060 seconds
- 1 controllers/cans for stabilized/spiked for the third day, source, 1@1060 seconds
- 2 controllers/cans for background ambient per each of three days, 6@1060 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Phase 6 (TBD)

Vehicle: Class 8 HDDT per study with Jamie Sanchez

Fuel: ULSD.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

This program includes the EtO sampling of the truck used in a separate study. There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 6 – 6 source, 7 ambient, 1 blank, 1 spiked □ 15 total (not including spare)

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, **3@**1060 seconds.
- 1 controller/can for each of three days for warm start HD-UDDS, source, **3@**1060 seconds
- **1** controllers/cans for stabilized/spiked for the third day, source, **1@**1060 seconds
- 2 controllers/cans for background ambient per each of three days, **6@**1060 seconds
- **1** can for outside background
- **1** can for blank
- **1** spare

## Message

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 6/11/2019 11:04:49 AM  
**To:** Craig Williams [CWilliams@css-inc.com]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** RE: Phase 3 - 0.1 ppb Quote

Thank you, yes.

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Wednesday, June 05, 2019 2:26 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** RE: Phase 3 - 0.1 ppb Quote

Hi Tom,  
 Looks like you didn't count the spare can. I get 25 cans total including the spare. Is this correct?

**Craig Williams**  
 Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
 An employee-owned company  
**Contractor to the USEPA**

---

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** Wednesday, June 05, 2019 9:12 AM  
**To:** Craig Williams  
**Cc:** Snow, Richard; Faircloth, James  
**Subject:** RE: Phase 3 - 0.1 ppb Quote

The Enthalpy quote looks good except the number of canister samplers. I do not want to reuse controllers for fear of possible cross-contamination:

24 cans => 22 controllers (3@505s+2@1372s+2@1372s+3@600s+6@1372s+6@600s)

Based on:

- 1 controller/can per each of **three** days for cold start, source, 3@505 seconds.
- 1 controller/can for each of **two** days for stabilized, source, 2@1372 seconds
- x2** controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of **three** days for source, US06, 3@600 seconds.
- 2 controllers/cans for background ambient per each of **three** days, 6@1372 seconds
- 2 controllers/cans per each of **three** days for background ambient for 6@600 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare



Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Wednesday, May 29, 2019 9:08 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** FW: Phase 3 - 0.1 ppb Quote

See quote below

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
An employee-owned company  
**Contractor to the USEPA**

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Friday, May 24, 2019 11:53 AM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; David Berkowitz  
**Subject:** Phase 3 - 0.1 ppb Quote

Hi Craig,  
See proposal for Phase 3 0.1ppb.

**Phase 3 Scope:**

Naturally aspirated PFI light-duty vehicle, E10 cert fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 3 – 9 source, 13 ambient, 1 blank, 1 spike -> 24 total  
1 controller per day for cold start, source, 505 seconds.  
1 controller for each of two days for stabilized, source, 1372 seconds  
2 controllers for stabilized/spiked for the third day, source, 1372 seconds  
1 controller per day for source, US06, 600 seconds.  
2 controllers for background ambient per day, 1372 seconds  
2 controllers per day for background ambient for 600 seconds

**Enthalpy Proposal, 0.1 ppb:**

Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

After samples have been analyzed at a 10 ppb RL if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high NOx, VOCs, CO, CO2, or other combustion products) or instrument operational viability becomes compromised. Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1 ppb due to the risks involved in pushing the instrumentation past that level are significant.

The total cost for analyzing up to 10 canisters to a 0.1 ppb RL is Ex. 3 Deliberative Process (D) which includes the analysis GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

**Supplies to be ready on 6/13/2019:**

*Supplies provided by Enthalpy:*

- 28 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 550 cc/min Canister Samplers
- 5 x 200 cc/min Canister Samplers

Bryan Tyler  
Vice President Environmental

800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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*Please take a moment to provide customer feedback*  
Terms and Conditions & Enthalpy Sample Acceptance Policy

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## Message

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 6/5/2019 1:12:07 PM  
**To:** Craig Williams [CWilliams@css-inc.com]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** RE: Phase 3 - 0.1 ppb Quote

The Enthalpy quote looks good except the number of canister samplers. I do not want to reuse controllers for fear of possible cross-contamination:

24 cans => 22 controllers (3@505x+2@1372s+2@1372s+3@600s+6@1372s+6@600s)

Based on:

1 controller/can per each of **three** days for cold start, source, 3@505 seconds.  
 1 controller/can for each of **two** days for stabilized, source, 2@1372 seconds  
**x2** controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds  
 x1 controller/can per each of **three** days for source, US06, 3@600 seconds.  
 2 controllers/cans for background ambient per each of **three** days, 6@1372 seconds  
 2 controllers/cans per each of **three** days for background ambient for 6@600 seconds  
 1 can for outside background  
 1 can for blank  
 1 spare

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Wednesday, May 29, 2019 9:08 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** FW: Phase 3 - 0.1 ppb Quote

See quote below

**Craig Williams**  
 Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
 An employee-owned company  
**Contractor to the USEPA**

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Friday, May 24, 2019 11:53 AM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; David Berkowitz  
**Subject:** Phase 3 - 0.1 ppb Quote

Hi Craig,  
 See proposal for Phase 3 0.1ppb.

**Phase 3 Scope:**

Naturally aspirated PFI light-duty vehicle, E10 cert fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 3 – 9 source, 13 ambient, 1 blank, 1 spike -> 24 total  
 1 controller per day for cold start, source, 505 seconds.  
 1 controller for each of two days for stabilized, source, 1372 seconds  
 2 controllers for stabilized/spiked for the third day, source, 1372 seconds  
 1 controller per day for source, US06, 600 seconds.  
 2 controllers for background ambient per day, 1372 seconds  
 2 controllers per day for background ambient for 600 seconds

**Enthalpy Proposal, 0.1 ppb:**

Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

After samples have been analyzed at a 10 ppb RL if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high NO<sub>x</sub>, VOCs, CO, CO<sub>2</sub>, or other combustion products) or instrument operational viability becomes compromised. Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1 ppb due to the risks involved in pushing the instrumentation past that level are significant.

The total cost for analyzing up to 10 canisters to a 0.1 ppb RL is \$1,340.00 which includes the analysis GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

**Supplies to be ready on 6/13/2019:**

*Supplies provided by Enthalpy:*

- 28 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 550 cc/min Canister Samplers
- 5 x 200 cc/min Canister Samplers

Bryan Tyler  
 Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713  
 O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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## Message

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 5/21/2019 4:49:51 PM  
**To:** Williams, Craig [williams.craig@epa.gov]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]  
**Subject:** Proposed plan and schedule

I sent the program office my proposed test plan and schedule and will let you know as soon as possible if that poses a problem to them. My assumption is that it will not. Once they have confirmed the plan and schedule, I will start on a PWS mod.

FYI, this is my proposal:

**Phase 1 (Complete)**

Source: Ex. 5 Deliberative Process (DP) 2.7L GDI  
 Fuel: Cert 3 E10  
 Lab: Light-duty dynamometer facility  
 Sampling days: 3  
 Driving schedule: FTP75  
 Sources: Phase 1 cold start and composite of Phase 2 stabilized with Phase 3 hot start

**Phase 2 (June 3)**

Vehicle: Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) L, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)  
 Fuel: Ultra-low sulfur diesel fuel.  
 Lab: Heavy-duty dynamometer facility.  
 Sampling days: 3  
 Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked → 15 total  
 4 controllers for 1060 seconds for two of the three days  
 5 controllers for 1060 seconds for the third day  
 Duration for all cans is 1060 seconds.

**Phase 3 (June 17)**

Vehicle: A common naturally aspirated PFI light-duty vehicle, e.g.,  
 Fuel: Tier 3 E10 cert fuel  
 Lab: Light-duty dynamometer facility.  
 Sampling days: 3  
 Driving schedules: FTP75 and Supplemental FTP.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

## Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

**Controllers required:**

1 controller per day for cold start transient, source, 505 seconds.  
 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds  
 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds  
 1 controller per day for source, US06, 596 seconds.  
 2 controllers for background ambient per day, 1372 seconds  
 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.  
 10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)  
 9 controllers set for 596 seconds (3 source, 6 background)  
 The blank and the outdoor ambient sample do not require controllers.

**Phase 4 (June 24 or July 8)**

Vehicle: Turbocharged GDI (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

**Cans required:**

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

**Controllers required:**

1 controller per day for cold start transient, source, 505 seconds.  
 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds  
 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds  
 1 controller per day for source, US06, 596 seconds.  
 2 controllers for background ambient per day, 1372 seconds  
 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.  
 10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)  
 9 controllers set for 596 seconds (3 source, 6 background)  
 The blank and the outdoor ambient sample do not require controllers.

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360

109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

## Appointment

**From:** Cullen, Angela [cullen.angela@epa.gov]  
**Sent:** 11/13/2019 7:21:36 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]; Kariher, Peter [Kariher.Peter@epa.gov]; Nessley, Libby [Nessley.Libby@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]  
**Subject:** EtO Discussion  
**Location:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE  
**Start:** 11/26/2019 3:00:00 PM  
**End:** 11/26/2019 3:30:00 PM  
**Show Time As:** Tentative

**Required Attendees:** Richard Baldauf; Long, Thomas; Loftis, Kathy; Walters, Charles; Cook, Rich; Fernandez, Antonio; Laroo, Chris; Hoyer, Marion; Faircloth, James; Kariher, Peter; Nessley, Libby; Kolowich, Bruce

**Ex. 6 Personal Privacy (PP)**

Please pass the invitation on to others, as appropriate

Updated Agenda:

- Concern with results from Ex. 4 CBI HD Gasoline Truck (Phase 5) from Chuck Walters:

*Reviewing the canister pressurization data on page 77, together with the controller data on page 78 of the Enthalpy report....*

*The controller flowrates selected for the 1060 s sample phase would suggest that 15 L canisters were used. However, the pressurization data and reported sample volumes indicate 6 L canisters. I suspect that 15 L canisters were actually used and this is a copy/paste issue in their pressurization spreadsheet. Furthermore, the spiking worksheets indicate 15 L canisters. If I back calculate all data using 15 L canister volume; the resulting calculated sample volume using the ideal gas law matches well with the expected sample volume based on flowrate and sample time.*

*My concern would be: Does this error continue downstream in the Enthalpy process to calculate a resulting concentration? I'm 95% convinced that the resulting canister Dilution Factor wouldn't change; however I don't know enough about the Enthalpy analysis and process to be sure that the resulting calculated concentration in the canister isn't affected.*

- Status of testing/results from Ex. 4 CBI LD Gasoline Truck (Phase 6)
- Status of contract for obtaining summa canisters from Enthalpy for nonroad testing at OTAQ
- Missing dyno data (Vmix and miles)
- Any bits of wisdom from Tom before he leaves us?



## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 4/8/2019 5:03:26 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]  
**CC:** Shores, Richard [Shores.Richard@epa.gov]  
**Subject:** RE: Enthalpy EO Quote

OK, now I see the cost est in the email – sorry about that. Let me know if our funding approach will work for you.

---

**From:** Long, Thomas  
**Sent:** Monday, April 08, 2019 12:48 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>  
**Subject:** FW: Enthalpy EO Quote

Marion,

I am attaching the response from Enthalpy. My understanding is that you will provide them the PR and funding. Please let me know when the deal is in place and we can expect to receive the cans/controllers. We're looking forward to supporting this project at RTP. Thanks for answering all of my questions leading up this point.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Bryan Tyler <bryan.tyler@enthalpy.com>  
**Sent:** Monday, April 08, 2019 12:04 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Thorne Gregory <thorne.gregory@enthalpy.com>  
**Subject:** Enthalpy EO Quote

Dear Thomas,

As discussed you would like to engage Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0219-074). Samples will be collected into individually blank checks 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode.

We anticipate analyzing approximately 15 canisters collected from active combustion sources at a significant dilution with an expected reporting limit (RL) of 10ppb. After all samples have been analyzed at the first dilution (10 ppb RL), if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from

smearing/overloading the instrument with other inseparable species (like high CO/CO<sub>2</sub>, combustion products) or instrument operational viability becomes compromised.

Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1ppb due to the risks involved in pushing the instrumentation past that level are significant.

In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10 ppb reporting limit and by EPA Method 3C (O<sub>2</sub>, CO<sub>2</sub>, Methane, CO) with a 0.10% reporting limit. See attached TO-15 target compound list.

## Ex. 4 CBI

Please let me know ASAP if you will be moving forward with this project.

Kind Regards,  
Bryan

*Please take a moment to provide customer feedback.*



**Bryan Tyler**

Vice President

Enthalpy Analytical, LLC

800 Capitola Drive, Suite 1

Durham, NC 27713

(919) 850-4392

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

[www.enthalpy.com](http://www.enthalpy.com)

[Terms and Conditions](#)

[Enthalpy Sample Acceptance Policy](#)

SSAS Laboratory ID: L0036, L0149 (metals only)

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## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 4/8/2019 5:02:44 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]  
**CC:** Shores, Richard [Shores.Richard@epa.gov]  
**Subject:** RE: Enthalpy EO Quote

Hi Tom,

The list attached was the speciation list, but I didn't see a cost estimate.

We don't have a contract with Enthalpy so we can get a PR to ORD-NRML. Rich C can work that through our system and with the contract level COR on your end. Let us know who the CL-COR is for Enthalpy when you get a chance. Does that work?

Justine brought up a good point that if Ingrid already analyzed these VOCs from this LD GDI, then we probably don't need to repeat that work in this contract.

We are so relieved they are willing to do this! Thank you tremendously for working with them on this.  
 Marion

---

**From:** Long, Thomas  
**Sent:** Monday, April 08, 2019 12:48 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>  
**Subject:** FW: Enthalpy EO Quote

Marion,

I am attaching the response from Enthalpy. My understanding is that you will provide them the PR and funding. Please let me know when the deal is in place and we can expect to receive the cans/controllers. We're looking forward to supporting this project at RTP. Thanks for answering all of my questions leading up this point.

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Bryan Tyler <bryan.tyler@enthalpy.com>  
**Sent:** Monday, April 08, 2019 12:04 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Thorne Gregory <thorne.gregory@enthalpy.com>  
**Subject:** Enthalpy EO Quote

Dear Thomas,

As discussed you would like to engage Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0219-074). Samples will be collected into individually blank checks 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode.

We anticipate analyzing approximately 15 canisters collected from active combustion sources at a significant dilution with an expected reporting limit (RL) of 10ppb. After all samples have been analyzed at the first dilution (10 ppb RL), if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high CO/CO<sub>2</sub>, combustion products) or instrument operational viability becomes compromised.

Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1ppb due to the risks involved in pushing the instrumentation past that level are significant.

In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10 ppb reporting limit and by EPA Method 3C (O<sub>2</sub>, CO<sub>2</sub>, Methane, CO) with a 0.10% reporting limit. See attached TO-15 target compound list.

## Ex. 4 CBI

Please let me know ASAP if you will be moving forward with this project.

Kind Regards,  
Bryan

*Please take a moment to provide [customer feedback](#).*



**Bryan Tyler**  
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[Terms and Conditions](#)  
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SSAS Laboratory ID: L0036, L0149 (metals only)

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## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 3/5/2019 5:55:45 PM  
**To:** Geidosch, Justine [Geidosch.Justine@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]  
**Subject:** FW: analysis labs for EtO

More info from Tiffany on sampling and analysis.

## Ex. 5 Deliberative Process (DP)

**From:** Yelverton, Tiffany  
**Sent:** Tuesday, March 05, 2019 12:50 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** RE: analysis labs for EtO

Hey Marion,

I'm sorry you'll be delayed in your scheduling – I know that is frustrating!

Tedlar bags are notorious for issues with diffusion and reactions, so I'm glad you're going with the SS SUMMA cans. You'll likely want to make sure your sampling lines and canisters are coated with Silco (but I should also be able to let you know initial thoughts on sampling losses from lines and analysis we see from our cans in the next few weeks – our cans were coated as were our sample lines).

You'll want your samples in the cans to be analyzed as soon as possible, but can be held for up to 30 days for TO-15 analysis of ambient samples. Source of course is a different beast – one that we are all working diligently on understanding better. There should be absolutely no issue with you shipping the canisters for analysis. This last sampling we did went through Enthalpy, but that was due mostly to location and ease of getting sampling equipment on a contract mechanism I have in place. I will likely be going to ALS when possible in the future.

I hope that answers your questions, but I'll also do my best to keep you informed on other information/insights we find through our testing. And, please don't hesitate to call or email with any other questions.

Best,  
Tiffany

---

Tiffany L. B. Yelverton, Ph.D.  
Mechanical Engineer  
Stationary Source Branch  
Office of Research & Development  
U. S. Environmental Protection Agency  
109 T. W. Alexander Drive (E305-01)  
Research Triangle Park, NC 27711

919.541.9456 (office)  
919.541.0554 (fax)

---

**From:** Hoyer, Marion  
**Sent:** Tuesday, March 05, 2019 12:39 PM  
**To:** Yelverton, Tiffany <Yelverton.Tiffany@epa.gov>  
**Subject:** RE: analysis labs for EtO

Hi Tiffany,

Thanks so much. No worries on timing, it looks like CRC RWG meeting is going to put a delay in our progress, so we are still just collecting information.

**Ex. 5 Deliberative Process (DP)** I can't find in my notes what you told us about stability of EtO in the canister (understanding that this is difficult to know for sure with exhaust), but I have a note about 4 hours being the longest hold time recommended for Tedlar bags. We will of course be using a SS canister, but I'm wondering if you recommend shipping over night and requiring X days of turnaround time on analysis.

Thanks for letting me know when you get a chance.

Marion

---

**From:** Yelverton, Tiffany  
**Sent:** Tuesday, March 05, 2019 8:58 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** RE: analysis labs for EtO

Hey Marion,

My apologies for the delayed response — yesterday was nuts for my meeting schedule and I never made it all the way through my email!!

The four labs considered reliable (and in order my personal preference to deal with) are:

## Ex. 5 Deliberative Process (DP)

I hope this helps, but please let me know if you have any other questions.

Best,  
Tiffany

---

Tiffany L. B. Yelverton, Ph.D.  
Mechanical Engineer  
Stationary Source Branch  
Office of Research & Development  
U. S. Environmental Protection Agency  
109 T. W. Alexander Drive (E305-01)

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---

**From:** Hoyer, Marion

**Sent:** Monday, March 04, 2019 1:20 PM

**To:** Yelverton, Tiffany <[Yelverton.Tiffany@epa.gov](mailto:Yelverton.Tiffany@epa.gov)>

**Subject:** analysis labs for EtO

Hi Tiffany,

I'm wondering if you could send me the name of the 4 labs you mentioned where EtO is being analyzed reliably. No hurry, we are still ironing out collection plans.

Thanks much,  
Marion



## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 8/1/2019 2:10:44 PM  
**To:** Walters, Charles [walters.charles@epa.gov]  
**Subject:** RE: Agenda Item for Enthalpy Meeting

Thanks Chuck, I let Peter know.

---

**From:** Walters, Charles <walters.charles@epa.gov>  
**Sent:** Thursday, August 01, 2019 8:51 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** Agenda Item for Enthalpy Meeting

Marion,

Follow-up to our meeting with ORD yesterday and the questions I have for Enthalpy.....

When we meet with Enthalpy; I propose to add an agenda item "Canister Pressurization data, Sample Flowrate, and Proportionality" and I can lead that discussion.

Thanks,  
 Chuck

---

**From:** Long, Thomas <Long.Thomas@epa.gov>  
**Sent:** Friday, July 26, 2019 1:10 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Walters, Charles <walters.charles@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: [Ex. 4 CBI] data review

Most of those questions will need to be posed to Enthalpy, but the can flow controllers were:

505 seconds ~ 670 ml/min  
 1372 seconds ~ 180 ml/min  
 1060 seconds ~ 180 ml/min

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Hoyer, Marion  
**Sent:** Friday, July 26, 2019 11:58 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Walters, Charles <walters.charles@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Laroo, Chris

<laroo.chris@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>

**Subject:** FW: [REDACTED] data review

Hi Tom,

Here are the questions Chuck has. Thanks for letting us know your thoughts.  
Marion

---

**From:** Walters, Charles

**Sent:** Thursday, July 25, 2019 10:54 AM

**To:** Cullen, Angela <cullen.angela@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>

**Subject:** [REDACTED] data review

All,

I reviewed the dyno data and Enthalpy report for the [REDACTED]. Since there are concerns with the EtO analysis; I only focused on canister sample collection and CO2 agreement. Here are my observations.

- The uncorrected bag CO2 vs canister CO2 agreed within 3% (see yellow areas in spreadsheet). This is significantly better than the [REDACTED] testing. I noticed that the vacuum decay in the canister was considerably smaller than the testing done on the [REDACTED]. The [REDACTED] final Pratios averaged 0.549; which is very near the 0.528 theoretical choked flow Pratio limit for an orifice. This would result in a more constant sample flow over the test phase providing a more representative sample over the phase. This could explain the better CO2 agreement in the [REDACTED] testing.
- Enthalpy presented the canister pressurization data differently for the [REDACTED]. It would be helpful if the data presentation was consistent. Specifically, the [REDACTED] report provided controller flow data for "initial flow" and "return flow" whereas the [REDACTED] report did not. I assume the "return flow" is the flowrate recorded at the end of sample canister vacuum using an inert gas. This data is very helpful in determining final flow rate as a function of vacuum decay over the sample phase. The [REDACTED] flow data shows initial vs return flow to be very similar (as expected due to the ending Pratio very near the theoretical limit of 0.528 as discussed above). It would be nice to have this data for the [REDACTED] and any future testing.

#### Proposed questions to Enthalpy and/or ORD

Below are proposed questions to Enthalpy. These questions are designed to get a better understanding of the before and after state of the sample flow and perhaps influence the controller flow selected for the sample period. I know that this method is still considered qualitative; however, if it transitions to quantitative we will need a better handle on the sample flow and proportionality. I'm not sure if now is the right time to be asking these questions nor do I have a read on cost impacts in asking these questions. We should discuss.

- Is "initial flow" vs "return flow" available for the [REDACTED] (similar to the data presented on page 89 of the [REDACTED] report)?
- Can the "initial flow" vs "return flow" data be included in the report for any future testing?
- Is "return flow" measured at the "as received" canister vacuum?
- What nominal flow rate is selected for each sample period? 505s, 1372s, 1060s
- What nominal flow rate options are available?

Thanks,  
Chuck

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/3/2019 12:14:09 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: Dyno Testing in RTP




Did you get the emission control label from Tom?

---

**From:** Cullen, Angela  
**Sent:** Friday, May 17, 2019 3:04 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Richard and Tom,

Thank you for our discussions this week and your work on this project. This email is to circle back with what we discussed yesterday. Our near-term priorities are:

1.  GDI, normal test conditions - completed
2.  diesel, normal test conditions, with cold-start UDDS and warm UDDS cycles
3. TBD LD gasoline vehicle (PFI, naturally-aspirated, Tier 2 or Tier 3 certification level, significant sales volume), E10 fuel, FTP cycle, normal test conditions
4.  GDI, normal test conditions, Tier 2 certification fuel or market E0 fuel, FTP cycle

The other testing suggestions you sent are still important, but we want to first scope out which mobile source sectors emit EtO. We will be having discussions with our lab early next week to explore what we can do to test nonroad engines.

When you get a chance, would you please send a picture of the  emission control label?

Thank you,  
 Angela

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, May 15, 2019 4:38 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Hi Richard,

I just made it back to my phone. I can call you if that would be helpful.

This is an excellent list of some of the top priorities as we see them too. Given the urgency around getting some initial/screening diesel data it might make sense to start there and then meet next week to discuss further testing with Angela and our light-duty center director, Mike Olechiw.

For the testing next week on the diesel can you run both a cold and warm cycle? I am not a testing expert so I've cc'd Angela as this is her area of expertise. If at all possible, this testing is the current highest priority.

We will start the PR for [REDACTED] so that we can get funds supporting this work ASAP. I am confident we can send additional funds in June or July. Since we'll figure that out as we go, it sounds from your note like that kind of incremental funding situation could work, but we can discuss this further.

After we get a chance to orient Bill Charmley, our division director, to the results tomorrow, we will be setting up recurring meetings with him and we will invite you to those recurring meetings so that he can also hear from you directly and we can be discussing next steps in real time together.

I honestly cannot thank you enough not only for making this work your top priority, but the fact that you are generating the highest quality data possible in this emerging issue that has many complexities, is extraordinarily commendable.

Thank you!  
Marion

---

**From:** Shores, Richard  
**Sent:** Wednesday, May 15, 2019 4:01 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Cc:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Subject:** Dyno Testing in RTP

Marion,

After some discussion with Tom, we have come up with a preliminary strategy for the testing that could be possible. Keep in mind that vehicle testing typically costs us [REDACTED] Ex. 4 CBI including the rental and no EtO testing. This last round of EtO testing costs us [REDACTED]. We are considering the following tests/vehicles.

1. [REDACTED] GDI, normal test conditions completed
2. [REDACTED] diesel, maybe start next week without integrated modal HC data
3. Class 8 diesel, should have integrated modal HC data being recorded
4. PFI, gas, considering the idea of two tests, normal and cold test conditions
5. [REDACTED] GDI, cold test conditions
6. TBD vehicle, possible some pre/post catalyst sampling with canisters only?

Notice we are suggesting cold condition testing, what do you think? This data set in completion should go a long way to defining if the mobile source emissions are a significant component of the inventory. Our testing programs are typically buffered with time, allowing us the opportunity to leverage other project resources but more importantly the time we have available for those primarily responsible for the dyno operation. Given our need to collect data at an accelerated schedule translates into additional contractor support and additional costs. Given all the variables here and understanding that every test we conduct may cause us to change direction, my suggestion is to start the [REDACTED] testing as soon as we can, with or without a continuous HC monitor. Testing the vehicles listed above is assumed to cost more than [REDACTED] but if you have that available, maybe we (ORD) can cover the additional costs. As this sampling occurs, we can keep in touch on the budget, specifically what the testing actually costs. Ultimately, we would like to complete the testing above with the funds available.

Richard Shores  
U.S. Environmental Protection Agency (E343-02)  
Office of Research and Development  
National Risk Management Research Laboratory  
Air and Energy Management Division  
Distributed Source & Buildings Branch  
Research Triangle Park, NC27711, USA  
Phone: (919) 541-4983  
email: [shores.richard@epa.gov](mailto:shores.richard@epa.gov)

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/17/2019 12:19:53 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Sargeant, Kathryn [sargeant.kathryn@epa.gov]  
**Subject:** FW: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21

**Importance:** High

FYI, Ines sent the request for ASD funds for EtO to Mike Haley.

---

**From:** Storhok, Ines  
**Sent:** Monday, June 17, 2019 7:57 AM  
**To:** Haley, Mike <Haley.Mike@epa.gov>  
**Cc:** Charmley, William <charmley.william@epa.gov>; Paff, Patricia <paff.patricia@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** RE: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21  
**Importance:** High

Mike – sorry about the delay, as I was out on Friday.

As you recall, I have sent you a previous request for ethylene oxide testing [Ex. 4 CBI]. Since then, ORD has updated the budget needs for the testing (an additional [Ex. 4 CBI]), so I'm including below an updated request for the OTAQ reserve funds.

**Request:** The emissions of ethylene oxide, currently the most significant driver for cancer risk in ambient air, has emerged in 2019 as an urgent issue that OTAQ is facing. Initial data suggests that at least LDGV may be emitting this highly carcinogenic compound and without delay, OTAQ needs to be generating emissions data to understand how wide-spread this issue might be among mobile sources and to understand the mechanisms of formation in order to identify mitigation measures.

The near-term activities for which ASD requires funding are focused on 1) collecting and analyzing exhaust samples from two LDGVs and two HDDVs in the ORD-NRMRL lab, and 2) developing capability for ORD to analyze mobile source exhaust in-house to expedite a larger volume of emissions test and lower future analysis costs into FY20. The outputs of this work will provide information on whether diesel exhaust contains ethylene oxide and provide information on how widespread the LDGV emissions of ethylene oxide are among different on-road technologies.

The total request for this proposal is [Ex. 4 CBI].

**NOTE:** I'm going to be out of the office 6/21-7/5. Please contact Trish for any funding questions. I'm also adding Marion to this email, so she is in the loop about the ethylene oxide request.

Thanks,

Ines

---

**From:** Charmley, William  
**Sent:** Wednesday, June 12, 2019 6:07 AM  
**To:** Storhok, Ines <storhok.ines@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>

**Subject:** FW: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21

**Importance:** High

Ines –

Is our proposal for ASD the equipment for ethylene oxide testing? If yes, can send that in response to Mike Haley by COB on Friday of this week?

Do we have any request for additional funding for the CTI rule?

Thanks

Bill

---

**From:** Haley, Mike

**Sent:** Monday, June 10, 2019 2:59 PM

**To:** Charmley, William <[charmley.william@epa.gov](mailto:charmley.william@epa.gov)>; Bunker, Byron <[bunker.byron@epa.gov](mailto:bunker.byron@epa.gov)>; Haugen, David <[haugen.david@epa.gov](mailto:haugen.david@epa.gov)>; Simon, Karl <[Simon.Karl@epa.gov](mailto:Simon.Karl@epa.gov)>

**Cc:** Cook, Leila <[cook.leila@epa.gov](mailto:cook.leila@epa.gov)>; Hengst, Benjamin <[Hengst.Benjamin@epa.gov](mailto:Hengst.Benjamin@epa.gov)>; Watkins, Erica <[Watkins.Erica@epa.gov](mailto:Watkins.Erica@epa.gov)>

**Subject:** FY 2019 OTAQ Reserve Funds - Request for Proposals

All –

As you may recall, when we finalized our Division allocations for the FY 2019 Operating Plan, Ex. 5 Deliberative Process (DP) was set aside in an OTAQ “Reserve” account. The purpose of this note is to now provide you an opportunity to submit proposals for use of this reserve funding. Consistent with the purpose of this reserve funding, your proposals should focus on addressing any unanticipated program needs or new priorities that have emerged since our initial Operating Plan allocations. The reserve funding should be considered a “one-time” adjustment to your Operating Plan totals and should not be considered as a permanent adjustment to your base programs. Proposals should also be for activities or actions that can be funded relatively quickly.

Please submit your funding proposals to me (with a cc: to the DD group) by COB, Friday, June 21. I’ll will compile any submissions received and we will discuss the proposals at our scheduled DD Working Group meeting on Tuesday, June 25. Your proposals should include a brief description of the activity for which you are requesting funding, the total amount of your request, and a brief description of the outputs or outcome expected to be achieved with your investment proposal. Let me know if you have any questions or need any additional information.

Mike H.

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/10/2019 5:11:02 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: Update on mobile source EtO testing and related issues

Thank you so much for this reply to Bill.

I meant to mention in our meeting that Tom Long told me they ran into problems testing the [REDACTED] last week so they are working on it again this week. I suspect the PFI testing is not going to happen next week, but he didn't say that.

**From:** Cullen, Angela  
**Sent:** Monday, June 10, 2019 12:04 PM  
**To:** Charmley, William <charmley.william@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Haugen, David <haugen.david@epa.gov>; Storhok, Ines <storhok.ines@epa.gov>  
**Cc:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Bryson, James <bryson.james@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>  
**Subject:** RE: Update on mobile source EtO testing and related issues

Bill,

Below are responses to two of your questions. If you are not comfortable with the approach, then we can make adjustments.

2) Regarding the Phase 3 (June 17) vehicle, what type of guidance is OTAQ giving to ORD regarding the selection of the pfi vehicle? Recent model year? Engine family with super high sales? Well maintained? Low, medium, high mileage? We have requested a recent model year (Tier 2 or Tier 3), high sales volume, well maintained, and PFI. We have not specified the mileage. ORD is working with Joe McDonald on the selection and they will let us know prior to testing the vehicle. We will know more later this week.

3) Regarding the fuel for the Phase 3 testing (June 17 week). I know that we must have discussed the potential for an E0 testing for Phase 3, in addition to the Tier 3 E10 fuel. What is the thinking on for this vehicle, testing only on a Tier 3 certification gasoline, and not also adding to the testing a Tier 2, E0 test fuel? We have been focusing on E10 fuel for the first round of LD gasoline testing because our first goal is to determine if/what mobile sources are contributing to the ambient EtO emissions. Because this is an in-use issue, we want to test with fuel that is representative of in-use fuel (E10). We prioritized the PFI testing with E10 next to continue to help answer what sources are contributing to the ambient EtO emissions. For now, we are testing a GDI and a PFI vehicle to cover the two major LD engine technologies. In addition, we only want to change one thing at a time. We will be comparing the results of Phase 1 with Phase 3 to understand any potential differences due to engine technologies. The evaluation with the E0 fuel is secondary as we try to try to understand potential mechanisms for the formation of EtO. If we find a difference in the results between Phases 1 and 4, then we will add E0 fuel to our light-duty testing matrix going forward.

Others may have additional information to add, so please feel free. And we'd be happy to discuss more with you.

Angela



**From:** Charmley, William

**Sent:** Monday, June 10, 2019 10:39 AM

**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Haugen, David <haugen.david@epa.gov>; Storhok, Ines <storhok.ines@epa.gov>

**Cc:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Bryson, James <bryson.james@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>

**Subject:** RE: Update on mobile source EtO testing and related issues

Dear Marion (and everyone),

Thank you for this update. Three questions.

- 1) Ines – please let David and I know if you need us to do any outreach to Mike Haley or Lee regarding the funding request for the analytical equipment
- 2) Regarding the Phase 3 (June 17) vehicle, what type of guidance is OTAQ giving to ORD regarding the selection of the pfi vehicle? Recent model year? Engine family with super high sales? Well maintained? Low, medium, high mileage?
- 3) Regarding the fuel for the Phase 3 testing (June 17 week). I know that we must have discussed the potential for an E0 testing for Phase 3, in addition to the Tier 3 E10 fuel. What is the thinking on for this vehicle, testing only on a Tier 3 certification gasoline, and not also adding to the testing a Tier 2, E0 test fuel?

Thanks

Bill

**From:** Hoyer, Marion

**Sent:** Monday, June 10, 2019 9:28 AM

**To:** Charmley, William <charmley.william@epa.gov>; Haugen, David <haugen.david@epa.gov>

**Cc:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Bryson, James <bryson.james@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>

**Subject:** Update on mobile source EtO testing and related issues

Bill and David,

We are on your calendars for June 27 to give you an update on ethylene oxide and discuss ongoing work and plans. Since we had to cancel this week's in-person update, we've briefly summarized highlights below.

■ NRMRL is finishing initial emissions testing for EtO from a [redacted] diesel truck this week ("Phase 2" test noted in the list below). We should have results in 3-4 weeks. NRMRL is moving down this list of vehicles to test in sequential order. We are talking about adding a HD gasoline truck after the Class 8 diesel (into July).

■ Three people from OTAQ (Chris Laroo, Kat Loftis, and Jim Bryson ) visited the NRMRL facility last Wednesday to learn about their sampling methods so that we can set up sampling into summa canisters here at NVFEL. We are meeting weekly to talk about next steps with regard to sampling here and priorities for the testing we'll be conducting.

■ Ines is working with Mike Haley to see if the IO can fund a [redacted] purchase of analytical equipment so that ORD can bring an analytical method on-line this summer/fall that is equivalent to the method used by the contractor we are currently using. This will provide the analysis capability we will need as we start to generate samples at NVFEL and continue to test in NRMRL. We are also talking with Bruce and Kat about the analytical methods they are evaluating.

Let us know if you have questions.

#### Phase 1 (Complete)

Source: Light-duty SI vehicle (Ex. 4 CBI)

#### Phase 2 (June 3)

Vehicle: [redacted] Ex. 5 Deliberative Process (DP) Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

#### Phase 3 (June 17)

Vehicle: A common naturally aspirated PFI light-duty vehicle

Fuel: Tier 3 E10 cert fuel

#### Phase 4 (June 24 or July 8)

Vehicle: [redacted] Ex. 5 Deliberative Process (DP) (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

#### Phase 5 (tbd)

Vehicle: Class 8 HDDT

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 5/16/2019 12:06:27 AM  
**To:** Geidosch, Justine [Geidosch.Justine@epa.gov]  
**Subject:** RE: NRMRL EtO Method Status

Thank you Justine! This is super helpful. I have started an EtO budget spreadsheet and will add this in for discussion as we move forward. Am I right in thinking she would need the ☐ for summa cans after she can upgrade the instrument?

---

**From:** Geidosch, Justine  
**Sent:** Wednesday, May 15, 2019 5:21 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>  
**Subject:** NRMRL EtO Method Status

I spoke with Ingrid George this afternoon about her work on developing the method for measuring EtO. She is still working on getting the method up and running; sounds like she has a bit more tweaking to get confidence in her method, but that she thinks they can get it working soon. She's been working with ambient samples to make sure she has the method down before she moves to working on exhaust samples.

They are planning on pulling ambient samples from two different sites this Summer and having her measure the EtO. Both are around RTP – one is a near roadway site and the other is more remote. I believe Ingrid said she was working with OAQPS on this, but I could be wrong about that.

She also mentioned that she needs to do some significant upgrades to her instrumentation to be able to get detection limits that are comparable to the contract labs. Ingrid's current equipment isn't optimized for EtO, and while the GCs she has are capable of doing the analysis, she needs upgrades, likely a new preconcentrator setup. She estimates it will cost about ☐ to get the instrument to where it needs to be for the best analysis. Also on the funding front, she needs a set of summa canisters that are better for EtO than the ones she uses for TO-15. I guess she has one or two cans, but would need a full set to do a good amount of dyno sampling. She thinks it would cost about ☐ for a set of 20. I told her I would check if OTAQ would be able to contribute any funding towards moving the analysis in house, so let me know if you have any thoughts.

Overall, got the impression that she is pretty confident in her ability to make the measurements, but doesn't think she'll be able to get to as low detection limits as we've seen from the contract labs without investing some money in the setup. Let me know if there are any additional questions you want me to look into.

Thanks,  
 Justine

Justine Geidosch  
 Physical Scientist, Assessment and Standards Division  
 Office of Transportation and Air Quality  
 US Environmental Protection Agency

Ph: (734) 214-4923  
[geidosch.justine@epa.gov](mailto:geidosch.justine@epa.gov)



## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 9/6/2019 10:26:07 AM  
**To:** Sargeant, Kathryn [sargeant.kathryn@epa.gov]  
**CC:** Cook, Rich [Cook.Rich@epa.gov]  
**Subject:** FW: ORD motor vehicle EtO testing

Forwarding so you are aware of our exchange with Lara Phelps and Rebecca Dodder on the need for the mobile EtO work which grew into an exchange on the RTP dyno facility and our need for aircraft emissions expertise. Bryan H is probably the person we need to get to next to make sure he hears our message directly before, as Lara puts it "the dust settles." I assume the meeting Bryan is holding with OTAQ is the place to express this need.

---

**From:** Dodder, Rebecca <Dodder.Rebecca@epa.gov>  
**Sent:** Thursday, September 05, 2019 2:21 PM  
**To:** Phelps, Lara <Phelps.Lara@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** RE: ORD motor vehicle EtO testing

Thank you for chiming in, Lara!

Rick and Marion, this is extremely helpful context and background on the work and the collaboration. Looking forward to working more with you.

Best,  
 Rebecca

---

**From:** Phelps, Lara <Phelps.Lara@epa.gov>  
**Sent:** Thursday, September 05, 2019 2:07 PM  
**To:** Cook, Rich <Cook.Rich@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Dodder, Rebecca <Dodder.Rebecca@epa.gov>  
**Subject:** RE: ORD motor vehicle EtO testing

Thank you, Rich! I can say that our folks here have echoed your sentiments, as well. I appreciate the cliff-notes too. That was well put. ☺

---

*Lara P. Phelps, Acting Director*

**National Risk Management Research Laboratory, Air and Energy Management Division**  
**U. S. Environmental Protection Agency, Office of Research and Development**  
 109 T.W. Alexander Drive (E343-04), Research Triangle Park, NC 27711  
 Office: 919-541-5544 | Cell: 984-287-0594 | Email: [phelps.lara@epa.gov](mailto:phelps.lara@epa.gov)

---

**From:** Cook, Rich <Cook.Rich@epa.gov>  
**Sent:** Thursday, September 05, 2019 2:04 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Phelps, Lara <Phelps.Lara@epa.gov>  
**Cc:** Dodder, Rebecca <Dodder.Rebecca@epa.gov>  
**Subject:** RE: ORD motor vehicle EtO testing

Just to elaborate a bit, a key reason the facility is so valuable to us is its flexibility to experiment with new techniques and methods, both in the dyno facility and the chem lab. Because of compliance and regulatory responsibilities, our lab is more heavily focused on standard methods, repeatability, and rigorous quality control. I have been involved with

coordination across our office since the early 1990's, and the working relationship between our two facilities has never been better or more mutually beneficial.

---

**From:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Sent:** Thursday, September 05, 2019 1:51 PM  
**To:** Phelps, Lara <[Phelps.Lara@epa.gov](mailto:Phelps.Lara@epa.gov)>  
**Cc:** Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Dodder, Rebecca <[Dodder.Rebecca@epa.gov](mailto:Dodder.Rebecca@epa.gov)>  
**Subject:** RE: ORD motor vehicle EtO testing

Thank you so much Lara. This does help and I appreciate you chiming in. The NRMRL facility is profoundly important to us even beyond the EtO work so anything we can do to elevate this and have the right people talking before that dust settles would be really good to do. Rich can chime in. We are hoping Tim W and Bryan H are talking soon about OTAQ's specific need for the NRMRL facility (both dyno and our need for aircraft emissions support).

Fingers crossed.

---

**From:** Phelps, Lara <[Phelps.Lara@epa.gov](mailto:Phelps.Lara@epa.gov)>  
**Sent:** Thursday, September 05, 2019 1:38 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Cc:** Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Dodder, Rebecca <[Dodder.Rebecca@epa.gov](mailto:Dodder.Rebecca@epa.gov)>  
**Subject:** FW: ORD motor vehicle EtO testing

Hey Marion!

I hope you are well. Rebecca looped me into your exchange, which I hope you do not mind. There is a lot of what I will call 'frantic' activity underway in the StRAP process. Between resource asks, resource availability, and shuffling, there are comments being collected for high level discussions to take place on where the dust will settle.

All I can say is everyone is sensitive to where we have high priority emerging concerns added to this research planning process, which is unavoidable and takes funds from other existing research areas with programmatic expectations. Management will do their best to find a balance. They know about the support our programmatic partners have invested in meeting current needs, as well, and are grateful.

Sorry I don't have more, but hope this helps.  
 Lara

---

*Lara P. Phelps, Acting Director*  
**National Risk Management Research Laboratory, Air and Energy Management Division**  
**U. S. Environmental Protection Agency, Office of Research and Development**  
 109 T.W. Alexander Drive (E343-04), Research Triangle Park, NC 27711  
 Office: 919-541-5544 | Cell: 984-287-0594 | Email: [phelps.lara@epa.gov](mailto:phelps.lara@epa.gov)

---

**From:** Dodder, Rebecca <[Dodder.Rebecca@epa.gov](mailto:Dodder.Rebecca@epa.gov)>  
**Sent:** Thursday, September 05, 2019 8:54 AM  
**To:** Phelps, Lara <[Phelps.Lara@epa.gov](mailto:Phelps.Lara@epa.gov)>  
**Subject:** FW: ORD motor vehicle EtO testing

Can I loop you into this email chain? Marion Hoyer added me to an EtO testing meeting, I won't be able to attend next Wed, 9/11 @ 9. She had some follow up questions about the timing of the work in the StRAP process.

---

**From:** Cook, Rich <Cook.Rich@epa.gov>  
**Sent:** Wednesday, September 04, 2019 3:54 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Dodder, Rebecca <Dodder.Rebecca@epa.gov>  
**Subject:** RE: ORD motor vehicle EtO testing

Just so you are aware Rebecca, we have provided Ex. 4 CBI in funding for dyno testing as well as Ex. 5 Endangerment Process (DP) in new equipment for the chem lab so far to move this work forward. The folks we have been working with in ORD on this have done a fantastic job developing methods.

---

**From:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Sent:** Wednesday, September 04, 2019 3:35 PM  
**To:** Dodder, Rebecca <Dodder.Rebecca@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>  
**Subject:** RE: ORD motor vehicle EtO testing

We are being told the mobile source EtO testing work in NRMRL is being delayed out to FY22 (as part of the StRAP – RACT process? Do you know who is making these decisions? We need to get to someone soon on this. Bryan Hubbell offered an office-specific conversation and we'll bring it up there but it might need addressing from multiple directions to get this changed/corrected.

---

**From:** Dodder, Rebecca <Dodder.Rebecca@epa.gov>  
**Sent:** Wednesday, September 04, 2019 3:32 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** RE: ORD motor vehicle EtO testing

Hi Marion,

That would be great to talk to Rich. Probably October would be best.

I've been coming up to speed on the EtO work. It's great to see that there is good collaboration and communication to really get some quick turnaround times on this work.

Coming into my branch chief role, I'll definitely want to make sure I'm doing what I can to keep this good momentum going, and at the very least, not get in the way 😊

Best,  
Rebecca

---

**From:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Sent:** Wednesday, September 04, 2019 12:14 PM  
**To:** Dodder, Rebecca <Dodder.Rebecca@epa.gov>  
**Subject:** RE: ORD motor vehicle EtO testing

Hi Rebecca,

Rich Cook can give you a call to provide some historical context and some current information on our need for NRML's extremely high quality research on EtO. Would it be best if he contacted you in October, or sooner?

Thanks for getting in touch 😊  
Marion

-----Original Appointment-----

**From:** Dodder, Rebecca <[Dodder.Rebecca@epa.gov](mailto:Dodder.Rebecca@epa.gov)>

**Sent:** Wednesday, September 04, 2019 11:58 AM

**To:** Hoyer, Marion

**Subject:** Tentative: ORD motor vehicle EtO testing

**When:** Wednesday, September 11, 2019 9:00 AM-10:00 AM (UTC-05:00) Eastern Time (US & Canada).

**Where:** 1-202-991-0477 8908907#

Hi Marion,

Thank you for including me on the meeting and I look forward to coming up to speed on the coordination between NRMRL and NVFEL for the vehicle testing work. I'll be officially taking on the branch chief role in October. I will be out of town next week and will unfortunately miss this meeting, but I will accept as tentative in case it moves and to keep in the loop.

Best regards,  
Rebecca

---

Rebecca Dodder, PhD  
U.S. EPA's Office of Research and Development  
Research Triangle Park, NC 27711  
(919) 541-5376  
[dodder.rebecca@epa.gov](mailto:dodder.rebecca@epa.gov)



## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 4/5/2019 9:28:08 PM  
**To:** Geidosch, Justine [Geidosch.Justine@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]  
**Subject:** FW: Ethylene oxide

Regarding this meeting with Ex. 4 CBI ---

I let Ex. 4 CBI know why we are interested in mobile source testing (urban and rural background levels well above the cancer risk level at which we take action to remove / reduce sources) and that time is important (we'd like to have data as soon as possible). I stressed the importance of Ex. 4 CBI needing to build on work the Agency's chemists have been doing the last several months to figure out interferences with trans-2-butene (I think that is the compound, but Justine will know for sure), NO plugging concentrators, sampling into lined summa canisters, etc, instead of start from scratch to bring up a collection and analysis method.

The goal of the conversation would be understanding from them how quickly they think they could bring up a method for analysis and some of the basic sample collection issues (do they already collect into summa canisters, do they have access to the lined canisters that Enthalpy uses, do they have a HD diesel we would want to test with (and without?) aftertreatment, etc.).

I think we want to pursue this avenue of getting data even if it appears ORD is moving forward, mostly so that we have some independent verification, but also to have access to one additional option for any follow-on research questions we need to answer if these initial results all show no EtO. Let me know if you have other thoughts or opinions on this.

Thanks,  
M

**Ex. 4 CBI**

# Ex. 4 CBI

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/10/2019 2:22:50 PM  
**To:** Sargeant, Kathryn [sargeant.kathryn@epa.gov]  
**Subject:** FW: Update on mobile source EtO testing and related issues

## Ex. 5 Deliberative Process (DP)

I'm iterating with NRMRL and they said they can test a Class 5 on their HD dyno (Angela said we can't do that there).

FYI I've gotten Mike O to put Tony in charge of all this emissions planning and prioritization work so I will have help next week when he is back.

**From:** Sargeant, Kathryn  
**Sent:** Monday, June 10, 2019 9:51 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** RE: Update on mobile source EtO testing and related issues

Thanks so much. This is a great email—chock full of information that is clearly presented and easy to follow and absorb. Thank you!!

**From:** Hoyer, Marion  
**Sent:** Monday, June 10, 2019 9:28 AM  
**To:** Charmley, William <charmley.william@epa.gov>; Haugen, David <haugen.david@epa.gov>  
**Cc:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Bryson, James <bryson.james@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>  
**Subject:** Update on mobile source EtO testing and related issues

Bill and David,

We are on your calendars for June 27 to give you an update on ethylene oxide and discuss ongoing work and plans. Since we had to cancel this week's in-person update, we've briefly summarized highlights below.

- NRMRL is finishing initial emissions testing for EtO from a [REDACTED] diesel truck this week ("Phase 2" test noted in the list below). We should have results in 3-4 weeks. NRMRL is moving down this list of vehicles to test in sequential order. We are talking about adding a HD gasoline truck after the Class 8 diesel (into July).
- Three people from OTAQ (Chris Laroo, Kat Loftis, and Jim Bryson ) visited the NRMRL facility last Wednesday to learn about their sampling methods so that we can set up sampling into summa canisters here at NVFEL. We are meeting weekly to talk about next steps with regard to sampling here and priorities for the testing we'll be conducting.
- Ines is working with Mike Haley to see if the IO can fund a [REDACTED] purchase of analytical equipment so that ORD can bring an analytical method on-line this summer/fall that is equivalent to the method used by the contractor we are currently using. This will provide the analysis capability we will need as we start to generate samples at NVFEL and continue to test in NRMRL. We are also talking with Bruce and Kat about the analytical methods they are evaluating.

Let us know if you have questions.

**Phase 1 (Complete)**

Source: Light-duty SI vehicle { Ex. 5 Deliberative Process (DP) }

**Phase 2 (June 3)**

Vehicle: 2011 Ford F250 Regular Cab, { Ex. 5 Deliberative Process (DP) }, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

**Phase 3 (June 17)**

Vehicle: A common naturally aspirated PFI light-duty vehicle

Fuel: Tier 3 E10 cert fuel

**Phase 4 (June 24 or July 8)**

Vehicle: { Ex. 5 Deliberative Process (DP) } charged GDI 2.7L (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

**Phase 5 (tbd)**

Vehicle: Class 8 HDDT

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 7/28/2019 3:52:00 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]  
**CC:** Nelson, Brian [nelson.brian@epa.gov]; Michael Olechiw (olechiw.michael@epa.gov) [olechiw.michael@epa.gov]; McDonald, Joseph [mcdonald.joseph@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]  
**Subject:** FW: Telecon with Enthalpy  
**Attachments:** Spiking worksheet EO.xlsx

Thorne followed up from the meeting last Friday with the attached spreadsheet. Kat received it directly too.

We'll be talking with OAQPS and ORD on the [redacted] results this Wed morning and after that hopefully someone in ORD can schedule a follow-on meeting with Enthalpy so that we can get more of our questions answered as we collectively continue to gain insight into measuring EtO.

FYI – Libby Nessley, cc'd below, is ORD's QA officer. She has designated the results of the [redacted] testing as qualitative only and she had some suggestions for additional spiked samples (and maybe other additions) in the next round of testing.

Enthalpy has the canisters from NRMRL testing the Dodge Caravan and they said Friday they don't have results yet. When Tom Long returns from vacation, they will conduct the testing on the [redacted] with EO.

Tom noted they have a HD as truck "lined up", but when I asked which one they picked, he said they haven't narrowed it to one yet (they are still looking into procurement and they have three on their radar – he didn't say which three but I assume they are all among those we'd requested). We can get an update on this from Tom next week.

---

**From:** Thorne Gregory <thorne.gregory@enthalpy.com>  
**Sent:** Friday, July 26, 2019 4:38 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; George, Ingrid <George.Ingrid@epa.gov>; Kariher, Peter <Kariher.Peter@epa.gov>; Bryan Tyler <bryan.tyler@enthalpy.com>; Nessley, Libby <Nessley.Libby@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Dewees, Jason <Dewees.Jason@epa.gov>; Nash, Dave <Nash.Dave@epa.gov>; Shappley, Ned <Shappley.Ned@epa.gov>; Yelverton, Tiffany <Yelverton.Tiffany@epa.gov>; Bryan Tyler <btyler@montrose-env.com>  
**Subject:** RE: Telecon with Enthalpy

Tom,

Please check through my math and make sure that I've entered the details of your prep correctly and that I haven't made any errors. I converted everything into moles, so I didn't subtract ppm directly, but the math should work out the same if you use delta ppm.

Thorne Gregory  
 Enthalpy Analytical

-----Original Appointment-----

**From:** Long, Thomas [mailto:[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)]

**Sent:** Friday, July 26, 2019 10:52 AM

**To:** Loftis, Kathy; George, Ingrid; Kariher, Peter; Thorne Gregory; Bryan Tyler; Nessley, Libby; Hoyer, Marion

**Cc:** Dewees, Jason; Nash, Dave; Shappley, Ned; Yelverton, Tiffany; Thorne Gregory; [bt Tyler@montrose-env.com](mailto:bt Tyler@montrose-env.com)

**Subject:** Telecon with Enthalpy

**When:** Friday, July 26, 2019 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).

**Where:** Teleconference

If this time works for everyone, I would like to facilitate a conversation between the EPA chemists and Enthalpy to try to better understand why the spiked can did not come back with the anticipated concentration.

Phone number 202-991-0477

Conference Code 5727383#

Images below

Peter's spike Can 0728

Enthalpy spiked can quantitation report Can 0728

Concurrent can with only sample Can 0079

[cid:image002.png@01D5439E.8A4A0C20cid:image001.png@01D5439E.5CCEAD00](#)

[cid:image004.png@01D5439F.F98C7310](#)

[cid:image005.png@01D5439F.F98C7310](#)

<< File: image001.png >> << File: image002.png >> << File: image003.png >> << File: image004.png >> << File: image005.png >>

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## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 12/26/2019 6:22:19 PM  
**To:** Baldauf, Richard [Baldauf.Richard@epa.gov]  
**Subject:** RE: our next general

## Ex. 6 Personal Privacy (PP)

Sorry about the confusion too. Let me know what else might work for you.

**From:** Baldauf, Richard <Baldauf.Richard@epa.gov>  
**Sent:** Thursday, December 26, 2019 1:14 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** RE: our next general

Just wanted to see again if 2 might work for you. Again, sorry for my confusion!

**From:** Baldauf, Richard  
**Sent:** Thursday, December 26, 2019 10:42 AM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Subject:** Re: our next general

Hi Marion, just seeing these messages. For some reason either the phone didn't ring or I just didn't see/hear it. And I am screwed up with the holiday schedules and was thinking we were cancelled for today. I am working from home and could call around 2 if that works. Sorry for the confusion

On Dec 26, 2019, at 10:25 AM, Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)> wrote:

Hi Rich,

The four topics I have on my list to discuss are below. Lmk when it would be good to touch base. Looks like you'll be out Jan 2 so our 1:1 then won't work and I'll be out the following Thursday.

1 – EtO dyno testing in 2020. Do you know if ORD would need any funding from OTAQ if additional testing was to be conducted in 2020? I can talk with Rebecca Dodder if that is best. And is staffing sufficient with Richard and Tom gone? I know James F is in charge now, just not sure what he is expected to handle. These are some of the questions we're wondering about before getting a TO together for Jacobs; I def appreciate you pinging us so that we could get this in given the long lead time needed for TOs.

2 – Did you get a chance to talk with Shores about your detail and specifically any discussion of the duty station issue that ORD would need to handle?

3 – I'm interested in your take on the new TRB organization and where you want to be plugging into that (esp wrt the sub-committees with urban planning components)

4 – I am working with an individual in NIEHS who is a pilot; he needs some expert guidance and input on aerosol sampling from his aircraft and am wondering if you can offer him advice or should I look around here (I know you are really super busy).

Thanks much! I hope you have a nice Birthday on Monday – treats with Zing are on the way 😊

Marion



## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/14/2019 1:04:35 PM  
**To:** Paff, Patricia [paff.patricia@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]  
**Subject:** FW: Funding for ethylene oxide with expiring funds

Forgot to add that with regard to the [REDACTED] of expiring funds you sent down to the ORD Jacobs contract yesterday, Richard Shores in ORD wants to be in touch with you and his FCO to make sure those expiring funds get committed ASAP. You are probably all over this, for which I am eternally grateful. I just wanted to make sure you know that our end user is now aware of it too and wants to do everything humanly possible to make sure we don't lose that money.

Richard Shores, if you need to reach him, is at: 919-541-4983. He is the branch chief (like a center director) for the dynamometer facility in ORD.

Let Rich or I know if you have any questions.

Thanks so much!!

Happy Birthday tomorrow!!☺

---

**From:** Hoyer, Marion  
**Sent:** Friday, June 14, 2019 9:00 AM  
**To:** Paff, Patricia <paff.patricia@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Storhok, Ines <storhok.ines@epa.gov>  
**Subject:** Funding for ethylene oxide with expiring funds

Hi Trish,

I am sorry for a late request on this, but I just found out NRMRL needs 4 [REDACTED] more to be able to complete the testing work for us through the end of September.

Can Rich work with you to cut another PR for [REDACTED] that needs to go to the same Jacobs contract that ORD runs?

Ines, I'll reply separately on the request form Haley for a write-up on this as an initiative.

Marion

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**From:** Hoyer, Marion  
**Sent:** Thursday, June 13, 2019 12:29 PM  
**To:** Paff, Patricia <paff.patricia@epa.gov>  
**Subject:** RE: Which funding line should I use. Don't worry about the balance of the money in that line, the work should match the funding line. Thanks RE: Additional funds needed for Ethylene oxide analysis from mobile sources

Hi there!

The funding line for this work is in HEBTC under 4812 (Near-source modeling and CMAQ improvement) and it needs to be renamed – it is item #11 and it should read: "Ethylene oxide testing"

Thx,  
M

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**From:** Paff, Patricia

**Sent:** Thursday, June 13, 2019 12:14 PM

**To:** Hoyer, Marion <hoyer.marion@epa.gov>

**Subject:** Which funding line should I use. Don't worry about the balance of the money in that line, the work should match the funding line. Thanks RE: Additional funds needed for Ethylene oxide analysis from mobile sources

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**From:** Hoyer, Marion

**Sent:** Thursday, May 30, 2019 10:46 AM

**To:** Storhok, Ines <storhok.ines@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>

**Cc:** Paff, Patricia <paff.patricia@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>

**Subject:** Additional funds needed for Ethylene oxide analysis from mobile sources

**Importance:** High

Hi, Our OTAQ ASD team (Angela, Mike O, Chris Laroo, Rich Cook, Tony F, and me) met yesterday on ethylene oxide issues, including the need to get more analytical capability on-line for EtO measurements (it is one of the main bottlenecks). We agreed that it would be most expedient short-term and efficient for the long-term if we help ORD bring their EtO analysis method on-line. ORD needs Ex. 4 CBI in order to accomplish this. It could still take them a few months, but we would have priority for sample analysis and it would be free.

If you are ok with this additional expenditure, please let me know.

Our current expenditures on EtO have totaled Ex. 4 CBI so this would bring it to Ex. 5.5 million plus the 700,000 ORD. The next need for expenditure on this issue would like come after we have more substantive conversations with TATD about bringing on-line the capacity to sample into canisters here, then conducting nonroad engine and LDGV dyno testing here. It will take a few weeks to develop plans and then funding needs for this next phase of testing.

Message

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**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 10/2/2019 2:21:08 PM  
**To:** Dodder, Rebecca [Dodder.Rebecca@epa.gov]  
**Subject:** EtO testing and budgets

Hi Rebecca,

Thanks for touching base this morning. I have the questions/info below that we can discuss over email or, if it turns out to be easier to talk, I can look for time on our calendars.

From what OAR has been told (I think from Bryan Hubbell), there is some, albeit, minimal amount of funding for the dyno facility to conduct EtO testing (I think Bryan used language like “to finish the planned testing”). We aren’t sure how much testing this will include (# vehicles, for example). Then there is the imminent staff attrition (we don’t have dates for Tom Long and Richard Snow’s retirements, but from what we know it is in the next year – is that right?). It will be helpful to know how you are seeing the lay of the land with regard to funds and FTE.

We have sent [REDACTED] to NRMRL, about half for the EtO dyno testing and Enthalpy analysis, and half for the new GC-MS in Mike Hay’s lab. Do you have a feel for when and how much OTAQ will need to contribute to keep the testing going in FY20? Tom Long gave me an estimate about a month ago that NRMRL would need [REDACTED]/vehicle from OTAQ (after the funds we supplied have run out – and I’m not sure when that is). Do you know how “solid” that [REDACTED] vehicle estimate is? We will likely be able to afford maybe 2 vehicles at this cost so we are looking for options and trying to bring testing capabilities up to speed here as quickly as possible.

I think these are all my questions, but the issues are, of course, not simple.

I look forward to being in touch when you have had some time to think about this.

Thanks!  
Marion

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 5/30/2019 10:27:58 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Shores, Richard [Shores.Richard@epa.gov]  
**Subject:** RE: Multi-phase EtO Study

Hi Tom and Richard,

I honestly have no way to estimate how long the 200K will provide sufficient support for the extensive testing you outlined below. If you have an estimate of the cost that you can share or a timeframe when you know you'll need additional support, that would be good to know. We are acquiring more funds from our front office for this work; our senior leadership team knows this is a high priority for our office.

We are extremely grateful for your willingness to invest all the FTE and facility resources that you are.

Please keep in touch on any funding needs as we move along.

Marion

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**From:** Long, Thomas  
**Sent:** Tuesday, May 21, 2019 12:31 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>  
**Subject:** Multi-phase EtO Study

Marion and Angela,

We are having a communication issue with one of our instruments in the lab which is delaying our ability to complete pre-test calibrations. Also, we have a key technician with a vacation scheduled for next week. We would like to postpone the testing to make sure we have experienced personnel at every position and have adequately confirmed our calibration requirements.

I am still waiting to hear about the THC analyzer. The have begun the evaluation but have not completed a diagnosis at which point we can evaluate the value of an expedited repair. I am also waiting to get a quote from Enthalpy which is due today.

I need to submit a Performance Work Statement mod and QAPP addendum for this work. Would you mind reviewing the tentative plan and schedule below and either confirm that this meets your requirements or recommend modifications? (There is probably more detail than you want about controllers, but I want to keep it all straight in my own mind as well.)

**Phase 1 (Complete)**

Source: Light-duty SI vehicle

Dilution: Can 0098 was 30.16:1; Can 0080 was 18.99:1; Can 0001 was 21.18:1. The dilution ratio varied during Cans 0728, 0039, and 0066 in the range of 26:1.

**Phase 2 (June 3)**

Vehicle: 2011 Ex. 3 Deliberate Process (DP) Regular Cab, **Ex. 4 CBI** Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)  
 Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked → 15 total

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

### Phase 3 (June 17)

Vehicle: A common naturally aspirated PFI light-duty vehicle

Fuel: Tier 3 E10 cert fuel

Lab: Light-duty dynamometer facility.

Sampling days: 3

Driving schedules: FTP75 and Supplemental FTP.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

Controllers required:

1 controller per day for cold start transient, source, 505 seconds.

1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds

2 controllers for stabilized-hot start transient/spiked for the third day, source, 1372 seconds

1 controller per day for source, US06, 596 seconds.

2 controllers for background ambient per day, 1372 seconds

2 controllers per day for background ambient for 596 seconds


3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

### Phase 4 (June 24 or July 8)

Vehicle: 2016  50 Turbocharged GDI 2.7L (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

Cans required:

- For the cold start phase of the FTP there will be a source can but no background.

- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

Controllers required:

1 controller per day for cold start transient, source, 505 seconds.

1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds

2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds

1 controller per day for source, US06, 596 seconds.

2 controllers for background ambient per day, 1372 seconds

2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

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Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

Message

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**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/10/2019 1:59:30 PM  
**To:** Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]  
**Subject:** RE: mobile source testing and in-house analysis for EtO

Good Morning Tiffany, I'm setting up the meeting below for June 25 and I'm wondering if you can help me with invitees. I have my list below and I unfortunately can't get anyone from OAQPS on the phone this morning to tell me Doris' last name – do you know? Is there anyone else you want me to include or we can just have people forward it as needed ----

Hope you had a nice weekend!

Marion

ORD:  
Yelverton  
Shores  
Long  
Baldauf  
McDonald

OAQPS:  
Weinstock  
Shapple  
Smith (Darcie)

OTAQ:  
Hoyer  
Cullen  
Olechiw  
Nelson  
Fernandez  
Laroo  
Kolowich  
Loftis  
Geidosch  
Cook

---

**From:** Yelverton, Tiffany  
**Sent:** Monday, June 03, 2019 12:29 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Weinstock, Lewis <Weinstock.Lewis@epa.gov>  
**Subject:** RE: mobile source testing and in-house analysis for EtO

Hey Marion,

I think a cross Office meeting would be helpful, and if it could be at the end of June I will likely be able to share more regarding the state of the StRAP Output/Products/etc. as well as our instrumentation and methods development.

Best,  
Tiffany

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*Tiffany L. B. Yelverton, Ph.D.*

Mechanical Engineer  
Stationary Source Branch  
Office of Research & Development  
U. S. Environmental Protection Agency  
109 T. W. Alexander Drive (E305-01)  
Research Triangle Park, NC 27711

919.541.9456 (office)

919.541.0554 (fax)

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**From:** Hoyer, Marion  
**Sent:** Monday, June 03, 2019 12:27 PM  
**To:** Yelverton, Tiffany <[Yelverton.Tiffany@epa.gov](mailto:Yelverton.Tiffany@epa.gov)>  
**Cc:** Weinstock, Lewis <[Weinstock.Lewis@epa.gov](mailto:Weinstock.Lewis@epa.gov)>  
**Subject:** RE: mobile source testing and in-house analysis for EtO

Are you both up for a cross office meeting on EtO later in June. I'm thinking that is a useful way to just update each other on source testing in general, analytical methods development, the RACT output/product development on EtO, new ambient data especially if anything source-oriented is being conducted, etc.

If you think this is a good use of time, let me know and I'll schedule something.

---

**From:** Yelverton, Tiffany  
**Sent:** Monday, June 03, 2019 11:09 AM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Cc:** Weinstock, Lewis <[Weinstock.Lewis@epa.gov](mailto:Weinstock.Lewis@epa.gov)>  
**Subject:** RE: mobile source testing and in-house analysis for EtO

Thank you for the heads up Marion!

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*Tiffany L. B. Yelverton, Ph.D.*

Mechanical Engineer  
Stationary Source Branch  
Office of Research & Development  
U. S. Environmental Protection Agency  
109 T. W. Alexander Drive (E305-01)  
Research Triangle Park, NC 27711



919.541.9456 (office)  
919.541.0554 (fax)

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**From:** Hoyer, Marion  
**Sent:** Saturday, June 01, 2019 4:19 PM  
**To:** Weinstock, Lewis <[Weinstock.Lewis@epa.gov](mailto:Weinstock.Lewis@epa.gov)>; Yelverton, Tiffany <[Yelverton.Tiffany@epa.gov](mailto:Yelverton.Tiffany@epa.gov)>  
**Subject:** mobile source testing and in-house analysis for EtO

~~I just wanted you to know that we are getting funds to Mike Hays for procurement of a new GC-MS so that Ingrid can get~~

## **Ex. 5 Deliberative Process (DP)**

instrument will be useful for other samples being generated too, so it is a win-win. I didn't coordinate this with you as it evolved this week as it needed to move very quickly (using expiring funds). Please let me know if this causes any concerns or if you have questions.

As an update, NRMRL is testing a diesel truck next week and then a second, high production LDGV and after that, the **Ex. 4 CBI** ethanol-free fuel. From there, a second HDDT will be tested.

We have three people visiting the NRMRL lab this coming week so that they can return with all the info needed to facilitate our ability to sample into summa canisters. Here in Ann Arbor, we are going to be testing nonroad engines and additional on-road vehicles as needed to evaluate different aftertreatments and temperatures and to start to understanding how it is being formed and what mitigation might work.

Let me know if you'd like more information or want to be engaged in testing plans as they develop.

Marion

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/10/2019 1:38:33 PM  
**To:** Cook, Rich [Cook.Rich@epa.gov]  
**Subject:** FW: Testing priorities for EtO NRMRL and NVFEL

This is FYI.

---

**From:** Hoyer, Marion  
**Sent:** Monday, June 10, 2019 9:07 AM  
**To:** Cullen, Angela <cullen.angela@epa.gov>; Michael Olechiw (olechiw.michael@epa.gov) <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Subject:** Testing priorities for EtO NRMRL and NVFEL

I'm looking for your insight and advice on how we want to constructively start to coalesce thinking around our needs and priorities with regard to what NRMRL is testing and what we want to prioritize once we have a method on-line. I think someone (Tony?) needs to take a leadership role in owning the LDGV testing moving forward. This person would keep track of what we consider the priority questions are with regard to next steps on LDGV (i.e., are there important questions we want to prioritize here in thinking about how EtO is being formed, are there opportunities we can leverage to get some initial useful information such as Stani's GPF testing, etc.) and keep us on track with those priorities, obviously changing direction as we learn more.

Angela and I will keep in touch with NRMRL on what they are finding and I will schedule meetings like the one below periodically so that our experts are in the room talking with NRMRL engineers and we are working together on our priorities, figuring out which testing is ideally suited for NRMRL vs NVFEL.

Eventually, we'll want to think about when/if we want to start to engage others (CARB, MECA, etc), but that seems a ways off.

Please let me know your thoughts on getting an issue owner/lead person on the LDGV testing priorities.

Thanks,  
 Marion

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**Subject:** Testing priorities for EtO NRMRL and NVFEL  
**Location:** AA-Room-Office-C35-ConfRoom/AA-OTQA-OFFICE  
  
**Start:** Wed 6/19/2019 10:00 AM  
**End:** Wed 6/19/2019 11:00 AM  
  
**Recurrence:** (none)  
  
**Meeting Status:** Meeting organizer  
  
**Organizer:** Hoyer, Marion  
**Required Attendees:** Angela Cullen; Rich Cook; Laroo, Chris; Geidosch, Justine; Nelson, Brian; Michael Olechiw; Walters, Charles; Fernandez, Antonio; Shores, Richard; Long, Thomas; Richard Baldauf; McDonald, Joseph

**Resources:**

AA-Room-Office-C35-ConfRoom/AA-OTAQ-OFFICE

**Ex. 6 Personal Privacy (PP)****Agenda:**

- Richard and Tom update on the testing they have completed so far and have planned (their phased testing plan is below).
- Discuss testing at NVFEL
- Bringing the canister sampling method on-line
- Sample analysis options
- Priorities and opportunities to collect initial information on LDGV emissions of EtO
- Nonroad engine testing update

**NRMRL EtO Testing****Phase 1 (Complete)**

Source: Light-duty SI vehicle

Dilution: Can 0098 was 30.16:1; Can 0080 was 18.99:1; Can 0001 was 21.18:1. The dilution ratio varied during Cans 0728, 0039, and 0066 in the range of 26:1.

**Phase 2 (June 3)**

Vehicle: **Ex. 5 Deliberative Process (DP)** Regular Cab, **Ex. 5 Deliberative Process (DP)**, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked → 15 total

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

### **Phase 3 (June 17)**

Vehicle: A common naturally aspirated PFI light-duty vehicle

Fuel: Tier 3 E10 cert fuel

Lab: Light-duty dynamometer facility.

Sampling days: 3

Driving schedules: FTP75 and Supplemental FTP.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.

- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

Controllers required:

1 controller per day for cold start transient, source, 505 seconds.

1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds

2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds

1 controller per day for source, US06, 596 seconds.

2 controllers for background ambient per day, 1372 seconds

2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

#### **Phase 4 (June 24 or July 8)**

Vehicle: Ex. 5 Deliberative Process (DP) Turbocharged GDI 2.7L (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

## Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

## Controllers required:

1 controller per day for cold start transient, source, 505 seconds.

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2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds

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The blank and the outdoor ambient sample do not require controllers.

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 11/26/2019 12:52:12 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: EtO Discussion

Hi, I'm going to miss this meeting if that is ok. My day is completely packed with meetings and I'm not in the office again till next Monday ...

-----Original Appointment-----

**From:** Cullen, Angela <cullen.angela@epa.gov>  
**Sent:** Wednesday, November 13, 2019 2:22 PM  
**To:** Cullen, Angela; Baldauf, Richard; Long, Thomas; Loftis, Kathy; Walters, Charles; Cook, Rich; Fernandez, Antonio; Laroo, Chris; Hoyer, Marion; Faircloth, James; Kariher, Peter; Nessley, Libby; Kolowich, Bruce  
**Subject:** EtO Discussion  
**When:** Tuesday, November 26, 2019 10:00 AM-10:30 AM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE

**Ex. 6 Personal Privacy (PP)**

Please pass the invitation on to others, as appropriate

Tentative Agenda:

- Status of results from **Ex. 4 CBI** Gasoline Truck (Phase 5) and **Ex. 4 CBI** Gasoline Truck (Phase 6)
- Status of contract for ~~obtaining~~ summa canisters from Entech ~~for road testing at OTAQ~~
- Any bits of wisdom from Tom before he leaves us?

Appointment

---

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 5/15/2019 5:13:21 PM  
**To:** Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]  
**Subject:** FW: EtO Testing Plans  
**Location:** AA-Room-Office-C35-ConfRoom/AA-OTAQ-OFFICE  
**Start:** 5/15/2019 5:00:00 PM  
**End:** 5/15/2019 6:00:00 PM  
**Show Time As:** Tentative

This is the meeting I just mentioned in my note. We are talking about the additional testing we can do ASAP now that we know there is a positive result from the LD GDI truck.

-----Original Appointment-----

**From:** Hoyer, Marion  
**Sent:** Wednesday, May 15, 2019 11:11 AM  
**To:** Hoyer, Marion; Cullen, Angela; Shores, Richard; Long, Thomas; Geidosch, Justine; Cook, Rich; McDonald, Joseph; Baldauf, Richard  
**Cc:** Yelverton, Tiffany  
**Subject:** EtO Testing Plans  
**When:** Wednesday, May 15, 2019 1:00 PM-2:00 PM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** AA-Room-Office-C35-ConfRoom/AA-OTAQ-OFFICE

**Ex. 6 Personal Privacy (PP)**



## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 3/19/2019 6:21:03 PM  
**To:** George, Ingrid [George.Ingrid@epa.gov]  
**CC:** Geidosch, Justine [Geidosch.Justine@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]  
**Subject:** FW: analysis labs for EtO

Here is Tiffany's input on labs

---

**From:** Yelverton, Tiffany  
**Sent:** Tuesday, March 05, 2019 8:58 AM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Subject:** RE: analysis labs for EtO

Hey Marion,

The four labs considered reliable (and in order my personal preference to deal with) are:

## Ex. 5 Deliberative Process (DP)

I hope this helps, but please let me know if you have any other questions.

Best,  
Tiffany

---

Tiffany L. B. Yelverton, Ph.D.  
Mechanical Engineer  
Stationary Source Branch  
Office of Research & Development  
U. S. Environmental Protection Agency  
109 T. W. Alexander Drive (E305-01)  
Research Triangle Park, NC 27711

919.541.9456 (office)  
919.541.0554 (fax)

Message

---

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 7/17/2019 9:26:48 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** FW: EtO for [REDACTED]

FYI. I called Tom.

---

**From:** Long, Thomas  
**Sent:** Wednesday, July 17, 2019 3:08 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** EtO for [REDACTED]

Our quality assurance manager is reviewing Enthalpy's report for the [REDACTED] data. Her turn around is usually pretty prompt. We should have results to you in the next few working days.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

Appointment

---

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 9/10/2019 2:30:32 PM  
**To:** Dodder, Rebecca [Dodder.Rebecca@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Michael Olechiw (olechiw.michael@epa.gov) [olechiw.michael@epa.gov]; Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; McDonald, Joseph [mcdonald.joseph@epa.gov]

**Subject:** ORD motor vehicle EtO testing

**Location:** **Ex. 6 Personal Privacy (PP)**

**Start:** 10/2/2019 2:00:00 PM

**End:** 10/2/2019 3:00:00 PM

**Show Time As:** Tentative

**Required Attendees:** Dodder, Rebecca; Cook, Rich; Cullen, Angela; Fernandez, Antonio; Laroo, Chris; Kolowich, Bruce; Nelson, Brian; Michael Olechiw (olechiw.michael@epa.gov); Yelverton, Tiffany; Loftis, Kathy; Walters, Charles; Long, Thomas; Shores, Richard; Baldauf, Richard; McDonald, Joseph

Let's reschedule given all the planning/prioritization going on right now.

Hi, It has been a couple weeks since we've touched base on the vehicle testing and we are hoping we can meet for at least 30 min to touch base on status and plans for testing in NRMRL and here in NVFEL.

Thank you Tom for moving the HD gas truck testing forward by having Enthalpy cleaning/preparing canisters!

One specific thing we want to discuss that we've touched on previously is obtaining canisters from Enthalpy through your mechanism for some comparison work here.

Let's also touch base on the Class 8 diesel truck testing and the NVFEL nonroad and other testing plans.

Thanks much,  
Marion

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/19/2019 9:33:02 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Shores, Richard [Shores.Richard@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]  
**Subject:** RE: [REDACTED] E10 Data

Thanks Tom! I think we probably can expect additional procurements or testing needs beyond this HD gas truck rental. What I'd like to propose is that keep a running tab of the additional funds needed (beyond the PRs for the [REDACTED] that are all underway), then in August (is this soon enough?) we send you another installment to cover all of these unanticipated expenses.

Let me know if this would work or if some other plan sounds preferable.

Thanks again, I really appreciate your ability to field our multiple requests and inquiries. If you are getting incoming requests from too many people in OTAQ on this EtO issue, let me know and we can easily find a way to consolidate into one POC that so your time is protected.

Marion

---

**From:** Long, Thomas  
**Sent:** Wednesday, June 19, 2019 1:37 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>  
**Subject:** RE: F150 E10 Data

Chris,

Here is the df and concentration data you requested.

Marion,

We'll have a truck quote ASAP.

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Long, Thomas  
**Sent:** Tuesday, June 18, 2019 2:34 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; McDonald, Joseph <mcdonald.joseph@epa.gov>

**Cc:** Shores, Richard <Shores.Richard@epa.gov>

**Subject:** F150 E10 Data

Please find attached:

1. Initial regulated emission data from the [REDACTED] E10
2. COC and can pressure log examples
3. QAPP for EtO (an addendum to our dyno QAPP)

Let me know if there is any other information you would find helpful.

I wanted to correct an earlier email. The main dyno QAPP is Category B and the EtO addendum is Category A.

Due to vacation schedules it has been necessary to revamp my expectations with regard to test dates. We can discuss this further tomorrow. Here is my current plan:

Phase 1 (Complete-Funding received)

Source: [REDACTED] 2.7L GDI

Fuel: Cert 3 E10

Lab: Light-duty dynamometer facility

Sampling days: 3

Driving schedule: FTP75

Sources: Phase 1 cold start and composite of Phase 2 stabilized with Phase 3 hot start

Phase 2 (June 5-12, Sampling Complete)

Vehicle: [REDACTED] Regular Cab, [REDACTED] Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There was both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both were tested on each of the 3 days of testing. Each day there was a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans was spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked = 15 total

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

Phase 3 (July 8-12)

Vehicle: MY2013 sequential PFI [REDACTED]

Fuel: Tier 3 E10 cert fuel

Lab: Light-duty dynamometer facility.

Sampling days: 3

Driving schedules: FTP75 and Supplemental FTP.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting spare).

#### Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds
- 3 controllers set for 505 seconds.
- 10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)
- 9 controllers set for 596 seconds (3 source, 6 background)
- The blank and the outdoor ambient sample do not require controllers.

#### Summary:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Phase 4 (July 24-28)

Vehicle: Turbocharged GDI  same vehicle as Phase 1).

Fuel: Tier 2 certification fuel (ethanol free) or market E0 fuel

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

#### Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.

- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting the spare).

#### Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

#### Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Phase 5 (August 12-16)

Vehicle: Gasoline heavy-duty truck

Fuel: TBD.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 5 – 6 source, 7 ambient, 1 blank, 1 spiked = 15 total (not including spare)

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

#### Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@1060 seconds.
- 1 controller/can for each of three days for warm start HD-UDDS, source, 3@1060 seconds
- 1 controllers/cans for stabilized/spiked for the third day, source, 1@1060 seconds
- 2 controllers/cans for background ambient per each of three days, 6@1060 seconds
- 1 can for outside background

- 1 can for blank
- 1 spare

Phase 6 (Date TBD)

Vehicle: Class 8 HDDT per study with James Sanchez

Fuel: ULSD.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

This program includes the EtO sampling of the truck used in a separate study. There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 6 – 6 source, 7 ambient, 1 blank, 1 spiked = 15 total (not including spare)

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@1060 seconds.
- 1 controller/can for each of three days for warm start HD-UDDS, source, 3@1060 seconds
- 1 controllers/cans for stabilized/spiked for the third day, source, 1@1060 seconds
- 2 controllers/cans for background ambient per each of three days, 6@1060 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

---

Thomas Long, Mechanical Engineer

Mail Drop E343-02

Building D Room 360

109 T. W. Alexander Drive

Research Triangle Park, NC 27711

Phone: 919-541-3944



## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 5/20/2019 12:22:55 PM  
**To:** Sargeant, Kathryn [sargeant.kathryn@epa.gov]  
**Subject:** FW: SLT agenda item for this week. Ethylene oxide and mobile sources.

I meant to cc you on this.

Also, I've been in touch with Mike O on the preliminary results this morning so he is aware. I thought he was back in the office, but he is in Geneva all week.

I'll send you what I have for the SLT in a few minutes.

---

**From:** Hoyer, Marion  
**Sent:** Monday, May 20, 2019 8:18 AM  
**To:** Charmley, William <charmley.william@epa.gov>  
**Subject:** RE: SLT agenda item for this week. Ethylene oxide and mobile sources.

Thank you Bill. I am assuming Angela will be presenting with me to speak to the testing.

---

**From:** Charmley, William  
**Sent:** Monday, May 20, 2019 8:14 AM  
**To:** Grundler, Christopher <grundler.christopher@epa.gov>; Watkins, Erica <Watkins.Erica@epa.gov>; Cook, Leila <cook.leila@epa.gov>  
**Cc:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** SLT agenda item for this week. Ethylene oxide and mobile sources.

Dear Lee and Erica

I would like 15 minutes at this weeks SLT on the subject of Ethylene Oxide.

This is a high priority request. I would like this to be the first agenda item so that Kathryn and Marion could join for this topic and give a short presentation to the OTAQ SLT in this subject.

Thanks  
 Bill

On May 15, 2019, at 10:29 AM, Grundler, Christopher <grundler.christopher@epa.gov> wrote:

Whoa

---

Christopher Grundler, Director  
 Office of Transportation and Air Quality  
 U.S. Environmental Protection Agency  
 202.564.1682 (Washington DC)  
 734.214.4207 (Ann Arbor MI)

734.645.5221 (mobile)  
[www.epa.gov/otaq](http://www.epa.gov/otaq)

On May 15, 2019, at 2:45 PM, Sargeant, Kathryn <[sargeant.kathryn@epa.gov](mailto:sargeant.kathryn@epa.gov)> wrote:

## Ex. 5 Deliberative Process (DP)

**From:** Grundler, Christopher  
**Sent:** Monday, May 13, 2019 9:34 AM  
**To:** Sargeant, Kathryn <[sargeant.kathryn@epa.gov](mailto:sargeant.kathryn@epa.gov)>  
**Cc:** Charmley, William <[charmley.william@epa.gov](mailto:charmley.william@epa.gov)>; Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Olechiw, Michael <[olechiw.michael@epa.gov](mailto:olechiw.michael@epa.gov)>; Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)>; Choi, David <[Choi.David@epa.gov](mailto:Choi.David@epa.gov)>  
**Subject:** RE: FYI on ethylene oxide: Sterigenics white paper on mobile source contributions in Willowbrook community

Got it. Thanks, and pls keep me posted on developments

---

Christopher Grundler, Director  
Office of Transportation and Air Quality  
U.S. Environmental Protection Agency  
202.564.1682 (Washington, DC)  
734.214.4207 (Ann Arbor, MI)

---

**From:** Sargeant, Kathryn  
**Sent:** Monday, May 13, 2019 9:16 AM  
**To:** Grundler, Christopher <[grundler.christopher@epa.gov](mailto:grundler.christopher@epa.gov)>  
**Cc:** Charmley, William <[charmley.william@epa.gov](mailto:charmley.william@epa.gov)>; Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Olechiw, Michael <[olechiw.michael@epa.gov](mailto:olechiw.michael@epa.gov)>; Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)>; Choi, David <[Choi.David@epa.gov](mailto:Choi.David@epa.gov)>  
**Subject:** FYI on ethylene oxide: Sterigenics white paper on mobile source contributions in Willowbrook community  
**Importance:** High

## Ex. 4 CBI

to get that set up. We have questions and concerns about the Sterigenics information, based on what little we know so far.

We are still awaiting results from ORD's emission testing of a LD GDI.

---

**From:** Koerber, Mike  
**Sent:** Friday, May 10, 2019 2:36 PM  
**To:** Rimer, Kelly <[Rimer.Kelly@epa.gov](mailto:Rimer.Kelly@epa.gov)>; Smith, Darcie <[Smith.Darcie@epa.gov](mailto:Smith.Darcie@epa.gov)>; Weinstock, Lewis <[Weinstock.Lewis@epa.gov](mailto:Weinstock.Lewis@epa.gov)>; Shappley, Ned <[Shappley.Ned@epa.gov](mailto:Shappley.Ned@epa.gov)>  
**Subject:** Fwd: Sterigenics Willowbrook Ambient Air Monitoring

Lew - Please share with OTAQ. I'd be interested in their reaction.

Sent from my iPhone

Begin forwarded message:

**From:** "Macnabb, Philip" <[PMacnabb@sterigenics.com](mailto:PMacnabb@sterigenics.com)>

**Date:** May 10, 2019 at 1:40:41 PM EDT

**To:** "[wehrum.bill@epa.gov](mailto:wehrum.bill@epa.gov)" <[wehrum.bill@epa.gov](mailto:wehrum.bill@epa.gov)>

**Cc:** "Woods, Clint" <[woods.clint@epa.gov](mailto:woods.clint@epa.gov)>, "Koerber, Mike" <[Koerber.Mike@epa.gov](mailto:Koerber.Mike@epa.gov)>, "[tcr@vnf.com](mailto:tcr@vnf.com)" <[tcr@vnf.com](mailto:tcr@vnf.com)>, "Hoffman, Kathy" <[KHoffman@sterigenics.com](mailto:KHoffman@sterigenics.com)>

**Subject:** Sterigenics Willowbrook Ambient Air Monitoring

Bill

Please find attached letter and additional report regarding concerns the company has around the results of ambient air monitoring conducted by the EPA around our Willowbrook, Illinois facility. We would be happy to have a discussion via phone or in person regarding this topic.

Thank you

**Philip Macnabb**

**President**

Sterigenics, A Sotera Health company

2015 Spring Rd, Suite 650

Oak Brook, IL 60523

[pmacnabb@sterigenics.com](mailto:pmacnabb@sterigenics.com)

[www.sterigenics.com](http://www.sterigenics.com)

O: (630) 928-1733



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## Appointment

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 8/14/2019 2:30:03 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Michael Olechiw [olechiw.michael@epa.gov] [olechiw.michael@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]; Kariher, Peter [Kariher.Peter@epa.gov]; Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]; George, Ingrid [George.Ingrid@epa.gov]; Hays, Michael [Hays.Michael@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Rosati, Jacky [Rosati.Jacky@epa.gov]; Nessley, Libby [nessley.libby@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; McDonald, Joseph [mcdonald.joseph@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Weinstock, Lewis [Weinstock.Lewis@epa.gov]  
**BCC:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE [AA-Room-Office-C147-ConfRoom@epa.gov]  
**Subject:** EtO emissions testing in NRMRL  
**Location:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE  
**Start:** 8/15/2019 4:00:00 PM  
**End:** 8/15/2019 5:00:00 PM  
**Show Time As:** Tentative

**Required Attendees:** Cullen, Angela; Walters, Charles; Fernandez, Antonio; Cook, Rich; Nelson, Brian; Michael Olechiw [olechiw.michael@epa.gov]; Long, Thomas; Shores, Richard; Kariher, Peter; Yelverton, Tiffany; George, Ingrid; Hays, Michael; Loftis, Kathy; Kolowich, Bruce; Rosati, Jacky; Nessley, Libby; Baldauf, Richard; McDonald, Joseph; Laroo, Chris; Weinstock, Lewis

## Ex. 6 Personal Privacy (PP)

Agenda for this meeting (open to additional topics!):

- Report out on the conversation with Enthalpy
- Discuss how the information we learn from Enthalpy informs testing plans for next LDGV (the Ex. 4 CBI with E10)

Message

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**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/8/2019 12:30:35 PM  
**To:** Geidosch, Justine [Geidosch.Justine@epa.gov]  
**Subject:** RE: update from Chris after visit to NRMRL for EtO testing

It sounds like Chris did not know that ORD is procuring a new GC-MS for Ingrid. I'm not sure the money is over there yet or the procurement is underway, so maybe Ingrid didn't say anything about it because she felt I was preliminary? Not sure. When you get a chance, you can let Chris know that we are hoping Ingrid will have the new GC-MS this summer.

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**From:** Geidosch, Justine  
**Sent:** Thursday, June 06, 2019 10:44 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** RE: update from Chris after visit to NRMRL for EtO testing

Hi Marion,

Good to hear. I know that there is a way to automate the cannister collection system, but given the volume of sampling probably isn't work setting up. Sounds like it would be easy enough to get the canister collection up and running here though.

I do wonder about his negative take on Ingrid being able to get her method up and running quickly. Maybe he wasn't aware that she is planning on getting new equipment that will greatly increase their labs capability?

I've also been having a lot of trouble with the network connection from home, so hearing that Chris was having trouble makes me feel a little better that it might not just be me. I'm using my EPA laptop though, not a personal one, so who knows. If you need me and I'm not responding quickly enough by email, just give me a call (Ex. 6 Personal Privacy (PP)) as my email has been going in and out. I may end up coming in this afternoon if it gets too bad.

Thanks,  
Justine

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**From:** Hoyer, Marion  
**Sent:** Thursday, June 06, 2019 8:11 AM  
**To:** Geidosch, Justine <Geidosch.Justine@epa.gov>  
**Subject:** update from Chris after visit to NRMRL for EtO testing

Just wanted you to have the nice detailed notes from Chris below as well as the insight into Kat's capabilities to get analysis up and running in our lab. I don't want to forward it to others (he sent it to Angela and I) because he had to send it from his personal device due to issues with connectivity to our VPN. I don't think anyone else needs this except you, but if you think others need this level of detail, let me know.

Marion

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Marion and Angela,

I have been having issues connecting my personal computer to the VPN since the latest securing update, so I am sending this from my personal address and I thought you might was a readout from yesterday's trip to RTP prior to my returning to the office on Monday.

The sampling setup is relatively easy to incorporate into the any of our test sites. They use a 6 L passivated, precleaned canister supplied by Enthalpy. Enthalpy also supplies a flow controller that consists of a passivated sample pathway that included a vacuum gauge and a venturi to ensure constant sample flow into the canister. The controller sample pathway is about 8 inches in total length. The controller flow is customized (within the range of available off the shelf venturi flow rates) for the duration of the test interval the sample is being drawn from. The flow rate is designed to maximize sample flow while ensuring that the vacuum is not totally drawn down over the test. For example the flow controller flow rate for Ph1 of the vehicle FTP is different than the one for a combined Ph2 and Ph3 (505s for Ph1 vs 1362 for Ph2/3). Initially they had Enthalpy supply a single control for each flow setting for a given suite of tests, meaning that they would reuse, for example, the Ph1 controller for all Ph1 testing on the [REDACTED]. They have modified the contract with Enthalpy so that for future testing the controllers are single-use, thus they will supply one per test. Their concern is contamination, but realistically I doubt there is an influence from reuse based on the test results we have seen from the [REDACTED].

We observed the test on the [REDACTED]. Angela, I did not get a picture of the emission label as the hood was down for testing and the test site was very busy. Tom said to follow-up with him and he will get you one. They don't attached the canister sample line to the controller or the controller to the canister until just prior to the start of the test. Everything is capped. About 10 minutes prior, they attach the controller to the canister and leave the upstream end capped. They then manually open the valve to perform a combined vacuum and leak check. The vacuum value is recorded. About 5 minutes prior the start of the test, they attached the upstream end of the controller to the sample line/probe. The sample/line probe is designed to be as short at possible. I would estimate that it is 18" long. It is 1/4 316 SS passivated with Restek's silcosteel passivation technology. The material is off the shelf supplied by Restek. Any Swagloc connectors are also passivated and supplied by Restek, but those are all a part of the controller supplied by Enthalpy. Their probe enters perpendicular to the flow in the tunnel and makes a 90 degree bend to face upstream. The probe is never removed. It protrudes 4" into the sample stream from the wall on an 18" diameter tunnel.

The driver honks the horn at the start of the test and the technician manually opens the valve on the canister to begin sampling. I don't think there is a way to automate it. The same occurs at the end of the test interval and the valve is closed. I can write up a detailed procedure to follow when I am in the office next week.

Based on what I observed, I believe that NRMRL is executing sound tests. I saw nothing of major concern.

We spent time talking to Ingrid on her method development and she is a long way off and really needs new equipment to get lower DLs. I suspect from now into the future, any analysis will need to be contracted out the Enthalpy.

I spent a lot of time talking to Kat as we had time to kill in the airport after the meeting. She is a very skilled chromatographer with a LOT of experience. I think it would be beneficial to send her the 400+ page report from Enthalpy on the [ ] along with the results summarized in the Excel file as I believe she will be able to determine if there is any potential for coelution of other analytes with EtO in Enthalpy's analytical method. I also believe that given the right resources (equipment) she could establish a method in our lab.


Let me know if you have any other questions for now. Photos are attached.

Chris

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 5/30/2019 2:29:07 PM  
**To:** Sargeant, Kathryn [sargeant.kathryn@epa.gov]; Charmley, William [charmley.william@epa.gov]  
**CC:** Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** EtO planning and another funding request

Thank you, this is really helpful!

For one quick update – samples for EtO are being collected from the  next week (not this week as I'd noted below). Chris Laroo will be going to RTP in the next two weeks or so with someone from TATD to get the configuration figured out so we can sample into Summa canisters here in the lab.

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**From:** Sargeant, Kathryn  
**Sent:** Thursday, May 30, 2019 8:23 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Charmley, William <charmley.william@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: EtO planning meeting

I just talked to Bill on the phone about this—I will summarize his thoughts here (since he's driving) and he can supplement/correct as necessary.

Bill is thinking that an every 2-week status check would be good. It could be entirely verbal, or just a few bullets—he's not looking for people to need to work to develop briefings or go into detail (except when/if you think it's needed).

Bill will ask Gail to schedule. He wants to invite Haugen to these (and suggest that Haugen bring anyone he wants to). Bill will have Marion, Angela, and me on the invitations too, with the understanding that you can invite whomever else you want to.

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**From:** Hoyer, Marion  
**Sent:** Tuesday, May 28, 2019 5:10 PM  
**To:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Charmley, William <charmley.william@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** EtO planning meeting

A few of us are meeting weekly to keep on top of the evolving nature of the emissions testing for EtO and related issues. (Our agenda for this week is below.) We are focusing on emissions testing and specific bottle necks to increasing the number of tests we can run. Let us know if you want to discuss any of these issues with us and/or if you have additional topics you want to make sure we are focusing on right now.

Also, can you let Angela and I know how often you would like us to put time on your calendars to update you or if you would prefer that for weeks when we do not have significant new information that we just email you, or do you have other suggestions?

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**Subject:** EtO planning meeting  
**Location:** AA-Room-Office-S109-ConfRoom/AA-OTAQ-OFFICE  
  
**Start:** Wed 5/29/2019 12:00 PM  
**End:** Wed 5/29/2019 12:30 PM  
  
**Recurrence:** (none)  
  
**Meeting Status:** Meeting organizer  
  
**Organizer:** Hoyer, Marion  
**Required Attendees:** Cullen, Angela; Cook, Rich; Fernandez, Antonio; Geidosch, Justine; Laroo, Chris; Michael Olechiw  
**Resources:** AA-Room-Office-S109-ConfRoom/AA-OTAQ-OFFICE

This is an internal OTAQ meeting on ethylene oxide to:

- Re-orient to our current priorities
- Understanding the [ ] GDI results
- Who is looking at the Enthalpy report from the [ ] GDI and what have we learned so far?
- ORD is planning to send test parameters from the vehicle testing cycles this week
- Update on research plan in ORD
- emissions test on [ ] diesel this week
- Discuss funding the ORD lab (Mike Hays/Ingrid George) to help them get their analytical instruments capable of EtO analysis ASAP
- Update on discussions in NVFEL for nonroad and LDGV testing
- Sending someone to ORD to be able to implement collection into Summa canisters in NVFEL
- Discuss how often we want to meet and who needs to be invited to these meetings; other ways to make sure we are keeping each other updated on events

If we have time, we can discuss the following, or we can cover this next week:

- Following up on the Sterigenics testing – meet with them to ask questions?
- Gain any insights / perspectives we can from the literature that OAQPS identified reporting EtO from mobile source combustion
- ATSDR is using the 1959 study in their public fact sheet to claim mobile sources emit EtO



## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/19/2019 3:49:14 PM  
**To:** Brusstar, Matt [brusstar.matt@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: Update on mobile source EtO testing and related issues

Will do!

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**From:** Brusstar, Matt  
**Sent:** Wednesday, June 19, 2019 9:29 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** FW: Update on mobile source EtO testing and related issues

Hi Marion and Angela,  
 Can you please also keep me in the loop on developments and upcoming briefings on this topic?  
 Thanks,  
 Matt

---

**From:** Cullen, Angela  
**Sent:** Monday, June 10, 2019 12:04 PM  
**To:** Charmley, William <charmley.william@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Haugen, David <haugen.david@epa.gov>; Storhok, Ines <storhok.ines@epa.gov>  
**Cc:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Bryson, James <bryson.james@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>  
**Subject:** RE: Update on mobile source EtO testing and related issues

Bill,

Below are responses to two of your questions. If you are not comfortable with the approach, then we can make adjustments.

2) Regarding the Phase 3 (June 17) vehicle, what type of guidance is OTAQ giving to ORD regarding the selection of the pfi vehicle? Recent model year? Engine family with super high sales? Well maintained? Low, medium, high mileage? We have requested a recent model year (Tier 2 or Tier 3), high sales volume, well maintained, and PFI. We have not specified the mileage. ORD is working with Joe McDonald on the selection and they will let us know prior to testing the vehicle. We will know more later this week.

3) Regarding the fuel for the Phase 3 testing (June 17 week). I know that we must have discussed the potential for an E0 testing for Phase 3, in addition to the Tier 3 E10 fuel. What is the thinking on for this vehicle, testing only on a Tier 3 certification gasoline, and not also adding to the testing a Tier 2, E0 test fuel? We have been focusing on E10 fuel for the first round of LD gasoline testing because our first goal is to determine if/what mobile sources are contributing to the ambient EtO emissions. Because this is an in-use issue, we want to test with fuel that is representative of in-use fuel (E10). We prioritized the PFI testing with E10 next to continue to help answer what sources are contributing to the ambient EtO emissions. For now, we are testing a GDI and a PFI vehicle to cover the two major LD engine technologies. In addition, we only want to change one thing at a time. We will be comparing the results of Phase 1 with

Phase 3 to understand any potential differences due to engine technologies. The evaluation with the E0 fuel is secondary as we try to try to understand potential mechanisms for the formation of EtO. If we find a difference in the results between Phases 1 and 4, then we will add E0 fuel to our light-duty testing matrix going forward.

Others may have additional information to add, so please feel free. And we'd be happy to discuss more with you.

Angela

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**From:** Charmley, William

**Sent:** Monday, June 10, 2019 10:39 AM

**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Haugen, David <[haugen.david@epa.gov](mailto:haugen.david@epa.gov)>; Storhok, Ines <[storhok.ines@epa.gov](mailto:storhok.ines@epa.gov)>

**Cc:** Sargeant, Kathryn <[sargeant.kathryn@epa.gov](mailto:sargeant.kathryn@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Olechiw, Michael <[olechiw.michael@epa.gov](mailto:olechiw.michael@epa.gov)>; Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>; Geidosch, Justine <[Geidosch.Justine@epa.gov](mailto:Geidosch.Justine@epa.gov)>; Fernandez, Antonio <[fernandez.antonio@epa.gov](mailto:fernandez.antonio@epa.gov)>; Baldauf, Richard <[Baldauf.Richard@epa.gov](mailto:Baldauf.Richard@epa.gov)>; McDonald, Joseph <[McDonald.Joseph@epa.gov](mailto:McDonald.Joseph@epa.gov)>; Walters, Charles <[walters.charles@epa.gov](mailto:walters.charles@epa.gov)>; Loftis, Kathy <[loftis.kathy@epa.gov](mailto:loftis.kathy@epa.gov)>; Bryson, James <[bryson.james@epa.gov](mailto:bryson.james@epa.gov)>; Kolowich, Bruce <[kolowich.bruce@epa.gov](mailto:kolowich.bruce@epa.gov)>

**Subject:** RE: Update on mobile source EtO testing and related issues

Dear Marion (and everyone),

Thank you for this update. Three questions.

- 1) Ines – please let David and I know if you need us to do any outreach to Mike Haley or Lee regarding the funding request for the analytical equipment
- 2) Regarding the Phase 3 (June 17) vehicle, what type of guidance is OTAQ giving to ORD regarding the selection of the pfi vehicle? Recent model year? Engine family with super high sales? Well maintained? Low, medium, high mileage?
- 3) Regarding the fuel for the Phase 3 testing (June 17 week). I know that we must have discussed the potential for an E0 testing for Phase 3, in addition to the Tier 3 E10 fuel. What is the thinking on for this vehicle, testing only on a Tier 3 certification gasoline, and not also adding to the testing a Tier 2, E0 test fuel?

Thanks  
Bill

---

**From:** Hoyer, Marion

**Sent:** Monday, June 10, 2019 9:28 AM

**To:** Charmley, William <[charmley.william@epa.gov](mailto:charmley.william@epa.gov)>; Haugen, David <[haugen.david@epa.gov](mailto:haugen.david@epa.gov)>

**Cc:** Sargeant, Kathryn <[sargeant.kathryn@epa.gov](mailto:sargeant.kathryn@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Olechiw, Michael <[olechiw.michael@epa.gov](mailto:olechiw.michael@epa.gov)>; Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>; Geidosch, Justine <[Geidosch.Justine@epa.gov](mailto:Geidosch.Justine@epa.gov)>; Fernandez, Antonio <[fernandez.antonio@epa.gov](mailto:fernandez.antonio@epa.gov)>; Baldauf, Richard <[Baldauf.Richard@epa.gov](mailto:Baldauf.Richard@epa.gov)>; McDonald, Joseph <[McDonald.Joseph@epa.gov](mailto:McDonald.Joseph@epa.gov)>; Walters, Charles <[walters.charles@epa.gov](mailto:walters.charles@epa.gov)>; Loftis, Kathy <[loftis.kathy@epa.gov](mailto:loftis.kathy@epa.gov)>; Bryson, James <[bryson.james@epa.gov](mailto:bryson.james@epa.gov)>; Kolowich, Bruce <[kolowich.bruce@epa.gov](mailto:kolowich.bruce@epa.gov)>

**Subject:** Update on mobile source EtO testing and related issues

Bill and David,

We are on your calendars for June 27 to give you an update on ethylene oxide and discuss ongoing work and plans. Since we had to cancel this week's in-person update, we've briefly summarized highlights below.

■ NRMRL is finishing initial emissions testing for EtO from a [redacted] diesel truck this week ("Phase 2" test noted in the list below). We should have results in 3-4 weeks. NRMRL is moving down this list of vehicles to test in sequential order. We are talking about adding a HD gasoline truck after the Class 8 diesel (into July).

■ Three people from OTAQ (Chris Laroo, Kat Loftis, and Jim Bryson ) visited the NRMRL facility last Wednesday to learn about their sampling methods so that we can set up sampling into summa canisters here at NVFEL. We are meeting weekly to talk about next steps with regard to sampling here and priorities for the testing we'll be conducting.

■ Ines is working with Mike Haley to see if the IO can fund a **Ex. 4 CBI** of analytical equipment so that ORD can bring an analytical method on-line this summer/fall that is equivalent to the method used by the contractor we are currently using. This will provide the analysis capability we will need as we start to generate samples at NVFEL and continue to test in NRMRL. We are also talking with Bruce and Kat about the analytical methods they are evaluating.

Let us know if you have questions.

#### **Phase 1 (Complete)**

Source: Light-duty SI vehicle (Ford F150 GDI)

#### **Phase 2 (June 3)**

Vehicle: 2011 [redacted] **Ex. 5 Deliberative Process (DP)** Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

#### **Phase 3 (June 17)**

Vehicle: A common naturally aspirated PFI light-duty vehicle

Fuel: Tier 3 E10 cert fuel

#### **Phase 4 (June 24 or July 8)**

Vehicle: [redacted] **Ex. 5 Deliberative Process (DP)** (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

#### **Phase 5 (tbd)**

Vehicle: Class 8 HDDT

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/12/2019 12:06:46 PM  
**To:** Storhok, Ines [storhok.ines@epa.gov]  
**CC:** Cullen, Angela [cullen.angela@epa.gov]; Sargeant, Kathryn [sargeant.kathryn@epa.gov]  
**Subject:** RE: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21

Hi Ines,

Here is a draft write-up. I am waiting for input from ORD to find out how far into this FY the [REDACTED] ASD has provided so far will last for the LDGV and HDDT testing and analysis that they are funding (they are more than matching our expenditure currently).

I am wondering if we need to provide this request as a joint ASD-TATD request? TATD has started investing in analysis method development and they are going to be bringing a new sample collection method on-line and then begin nonroad testing.

**Request:** The emissions of ethylene oxide, currently the most significant driver for cancer risk in ambient air, has emerged in 2019 as an urgent issue that OTAQ is facing. Initial data suggests that at least LDGV may be emitting this highly carcinogenic compound and without delay, OTAQ needs to be generating emissions data to understand how wide-spread this issue might be among mobile sources and to understand the mechanisms of formation in order to identify mitigation measures.

The near-term activities for which ASD requires funding are focused on 1) collecting and analyzing exhaust samples from two LDGVs and two HDDVs in the ORD-NRMRL lab, and 2) developing capability for ORD to analyze mobile source exhaust in-house to expedite a larger volume of emissions test and lower future analysis costs into FY20. The outputs of this work will provide information on whether diesel exhaust contains ethylene oxide and provide information on how widespread the LDGV emissions of ethylene oxide are among different on-road technologies.

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**From:** Storhok, Ines  
**Sent:** Wednesday, June 12, 2019 7:04 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** Fwd: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21

Marion:

See Haley's request below to all Divisions. Our request for the [REDACTED] prompted this process with the SLT.

Can you summarize the request for the [REDACTED] based on Haley's email below (see underlined text below)? Even though Haley is already aware of the need (as I requested the money a couple of weeks ago), I want to send him a brief summary that directly responds to his request below that he could present to SLT.

This is also an opportunity to add any additional details, if there is any new info.

Thanks,

Ines

Begin forwarded message:

**From:** "Charmley, William" <[charmley.william@epa.gov](mailto:charmley.william@epa.gov)>  
**Date:** June 12, 2019 at 6:06:34 AM EDT  
**To:** "Storhok, Ines" <[storhok.ines@epa.gov](mailto:storhok.ines@epa.gov)>, "Sargeant, Kathryn" <[sargeant.kathryn@epa.gov](mailto:sargeant.kathryn@epa.gov)>  
**Subject:** FW: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21

Ines –

Is our proposal for ASD the equipment for ethylene oxide testing? If yes, can send that in response to Mike Haley by COB on Friday of this week?

Do we have any request for additional funding for the CTI rule?

Thanks

Bill

---

**From:** Haley, Mike  
**Sent:** Monday, June 10, 2019 2:59 PM  
**To:** Charmley, William <[charmley.william@epa.gov](mailto:charmley.william@epa.gov)>; Bunker, Byron <[bunker.byron@epa.gov](mailto:bunker.byron@epa.gov)>; Haugen, David <[haugen.david@epa.gov](mailto:haugen.david@epa.gov)>; Simon, Karl <[Simon.Karl@epa.gov](mailto:Simon.Karl@epa.gov)>  
**Cc:** Cook, Leila <[cook.leila@epa.gov](mailto:cook.leila@epa.gov)>; Hengst, Benjamin <[Hengst.Benjamin@epa.gov](mailto:Hengst.Benjamin@epa.gov)>; Watkins, Erica <[Watkins.Erica@epa.gov](mailto:Watkins.Erica@epa.gov)>  
**Subject:** FY 2019 OTAQ Reserve Funds - Request for Proposals

All –

As you may recall, when we finalized our Division allocations for the FY 2019 Operating Plan, was set aside in an OTAQ "Reserve" account. The purpose of this note is to now provide you an opportunity to submit proposals for use of this reserve funding. Consistent with the purpose of this reserve funding, your proposals should focus on addressing any unanticipated program needs or new priorities that have emerged since our initial Operating Plan allocations. The reserve funding should be considered a "one-time" adjustment to your Operating Plan totals and should not be considered as a permanent adjustment to your base programs. Proposals should also be for activities or actions that can be funded relatively quickly.

Ex. 5 Deliberative Process (DP)

Please submit your funding proposals to me (with a cc: to the DD group) by COB, Friday, June 21. I'll will compile any submissions received and we will discuss the proposals at our scheduled DD Working Group meeting on Tuesday, June 25. Your proposals should include a brief description of the activity for which you are requesting funding, the total amount of your request, and a brief description of the outputs or outcome expected to be achieved with your investment proposal. Let me know if you have any questions or need any additional information.

Mike H.



Message

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**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 9/4/2019 3:31:18 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: ORD motor vehicle EtO testing

Hi Tom,

Thanks for letting us know. No worries. We have this type of thing happen not infrequently so we totally understand.

I moved the cross-office meeting on EtO next week so that Tiffany could attend since we need an update on the A-E StRAP output on EtO. But we'll have our mobile source-specific meeting Wed morning so I'm glad you won't be testing.

Marion

-----Original Appointment-----

**From:** Long, Thomas <Long.Thomas@epa.gov>  
**Sent:** Wednesday, September 04, 2019 11:00 AM  
**To:** Hoyer, Marion  
**Subject:** Accepted: ORD motor vehicle EtO testing  
**When:** Wednesday, September 11, 2019 9:00 AM-10:00 AM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** Ex. 6 Personal Privacy (PP)

Unfortunately, we have hit a significant road block. We will not be able to test next week because Enthalpy will not have canisters ready, which I found out yesterday. Some of our instruments and crew will then be deploying to the field for a study. I tried to rearrange that work but there were too many parties involved to make last minute adjustments. This prevents us from being able to do the heavy-duty gas truck until October 21. My apologies.

Appointment

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**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 7/23/2019 7:08:32 PM  
**To:** Shores, Richard [Shores.Richard@epa.gov]  
**Subject:** FW: EtO Testing Status Update  
**Location:** N158  
  
**Start:** 7/30/2019 7:05:00 PM  
**End:** 7/30/2019 7:55:00 PM  
**Show Time As:** Tentative

Hi Richard,

Can you join us for this meeting with our division director next Tuesday? We are going to be talking with him about the results that Tom sent over today. I know Tom is on vacation, otherwise we'd of course be inviting him too.

Let me know if you are available at this time.

Marion

-----Original Appointment-----

**From:** Charmley, William  
**Sent:** Monday, June 03, 2019 2:27 PM  
**To:** Charmley, William; Sargeant, Kathryn; Hoyer, Marion; Cullen, Angela; Haugen, David  
**Cc:** Brusstar, Matt; Walters, Charles; Kolowich, Bruce; Nelson, Brian; Olechiw, Michael; Cook, Rich; Loftis, Kathy; Fernandez, Antonio; McDonald, Joseph; Laroo, Chris  
**Subject:** EtO Testing Status Update  
**When:** Tuesday, July 30, 2019 3:05 PM-3:55 PM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** N158

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 7/8/2019 12:36:19 PM  
**To:** Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]  
**Subject:** RE: Mobile source EtO testing

Thank you so much for telling me, I am still assembling my mental map of the people engaged in this work and who would want/need to be at each meeting. I just added him for today's call!

Hope your Monday is starting off well.  
 Marion

---

**From:** Yelverton, Tiffany  
**Sent:** Monday, July 08, 2019 8:24 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** RE: Mobile source EtO testing

Hey Marion,

If you think it is appropriate, you might want to include Peter Kariher on this call. He has helped the dyno team with their sampling, SUMMA can spiking and reviewed some of their data from Enthalpy. He has also been working on the impinger method for EtO (similar to the cartridge sampling Kat is working on in your group) and has years of experience with sampling obstacles in general.

I honestly don't know if he's in the office today, but if you do feel comfortable adding him, and he's available, I'm sure he would call in to this or future meetings of similar discussion.

Best,  
 Tiffany

---

*Tiffany L. B. Yelverton, Ph.D.*

Mechanical Engineer  
 Stationary Source Branch  
 Office of Research & Development  
 U. S. Environmental Protection Agency  
 109 T. W. Alexander Drive (E305-01)  
 Research Triangle Park, NC 27711

919.541.9456 (office)  
 919.541.0554 (fax)

-----Original Appointment-----

**From:** Hoyer, Marion  
**Sent:** Sunday, June 23, 2019 2:57 PM  
**To:** Hoyer, Marion; Cullen, Angela; Cook, Rich; Laroo, Chris; Nelson, Brian; Olechiw, Michael; Walters, Charles; Fernandez, Antonio; Shores, Richard; Long, Thomas; Baldauf, Richard; Yelverton, Tiffany; McDonald, Joseph; George, Ingrid; Hays, Michael; Choi, David; Loftis, Kathy

**Cc:** Weinstock, Lewis

**Subject:** Mobile source EtO testing

**When:** Monday, July 08, 2019 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).

**Where:** AA-Room-Office-S109-ConfRoom/AA-OTAQ-OFFICE

## Ex. 6 Personal Privacy (PP)

This meeting is to continue our discussion of the testing underway in NRMRL and the planning for testing here in NVFEL.

Our agenda for this meeting:

- Follow-up from 7/2 cross-office conversation on the nascent stage of EtO sample collection and analysis, particularly for source samples
  - What are the key uncertainties in the methods we are currently applying to understand mobile sources and EtO emissions?
  - Should we be considering all results purely qualitative until full methods development and cross-meth/cross-lab "shoot-out" (i.e., is there too much uncertainty in the measurements we are taking now to estimate an emission factor and have any trust in it)?
- Update from NRMRL on results from the Ex. 6 Personal Privacy (PP)
- Update from NRMRL on plans and sequencing for vehicles to be tested next in July and August
  - Week of July 8, PFI with E10
  - Later in July, Ex. 6 Personal Privacy (PP) with E0
  - August HD Gasoline truck E10
- Update from NVFEL on testing plans
  - Preparing for sample collection
  - Engines to prioritize - Nonroad

## Appointment

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 7/8/2019 12:36:15 PM  
**To:** Kariher, Peter [Kariher.Peter@epa.gov]  
**Subject:** FW: Mobile source EtO testing  
**Location:** AA-Room-Office-S109-ConfRoom/AA-OTAO-OFFICE  
**Start:** 7/8/2019 3:00:00 PM  
**End:** 7/8/2019 4:00:00 PM  
**Show Time As:** Tentative

-----Original Appointment-----

**From:** Hoyer, Marion  
**Sent:** Sunday, June 23, 2019 2:57 PM  
**To:** Hoyer, Marion; Cullen, Angela; Cook, Rich; Laroo, Chris; Nelson, Brian; Michael Olechiw (olechiw.michael@epa.gov); Walters, Charles; Fernandez, Antonio; Shores, Richard; Long, Thomas; Baldauf, Richard; Yelverton, Tiffany; McDonald, Joseph; Loftis, Kathy; George, Ingrid; Hays, Michael; Choi, David  
**Cc:** Weinstock, Lewis  
**Subject:** Mobile source EtO testing  
**When:** Monday, July 08, 2019 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** AA-Room-Office-S109-ConfRoom/AA-OTAO-OFFICE

## Ex. 6 Personal Privacy (PP)

This meeting is to continue our discussion of the testing underway in NRMRL and the planning for testing here in NVFEL.

Our agenda for this meeting:

- Follow-up from 7/2 cross-office conversation on the nascent stage of EtO sample collection and analysis, particularly for source samples
  - What are the key uncertainties in the methods we are currently applying to understand mobile sources and EtO emissions?

## Ex. 5 Deliberative Process (DP)

and have any trust in it)?

- Update from NRMRL on results from the Ex. 5 Deliberative Process (DP)
- Update from NRMRL on plans and sequencing for vehicles to be tested next in July and August
  - Week of July 8, PFI with E10
  - Later in July, Ex. 5 Deliberative Process (DP) with E0
  - August HD Gasoline truck E10
- Update from NVFEL on testing plans
  - Preparing for sample collection
  - Engines to prioritize - Nonroad

Message

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**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 9/4/2019 2:54:36 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: Meeting Forward Notification: ORD motor vehicle EtO testing

Thx, I meant to email you to tell you I added him a sec after sending it (I wish Outlook allowed this to be visible).

I also wanted to ask you if the folks you met with yesterday think that we really are seeing EtO in mobile exhaust. I'm curious to get a broader "pulse" on that from our strong technical leads.

-----Original Appointment-----

**From:** Microsoft Outlook <MicrosoftExchange329e71ec88ae4615bbc36ab6ce41109e@usepa.onmicrosoft.com> **On Behalf Of** Cullen, Angela  
**Sent:** Wednesday, September 04, 2019 10:53 AM  
**To:** Hoyer, Marion  
**Subject:** Meeting Forward Notification: ORD motor vehicle EtO testing  
**When:** Wednesday, September 11, 2019 1:00 PM-2:00 PM (UTC+00:00) Monrovia, Reykjavik.  
**Where:** Ex. 6 Personal Privacy (PP)

### Your meeting was forwarded

Cullen, Angela has forwarded your meeting request to additional recipients.

#### Meeting

ORD motor vehicle EtO testing

#### Meeting Time

Wednesday, September 11, 2019 9:00 AM-10:00 AM.

#### Recipients

Walters, Charles

All times listed are in the following time zone: (UTC-05:00) Eastern Time (US %2A Canada)

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Sent by Microsoft Exchange Server

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 8/1/2019 6:09:20 PM  
**To:** Shores, Richard [Shores.Richard@epa.gov]  
**Subject:** RE: Additional questions for Ethalpy

Thanks!

---

**From:** Shores, Richard <Shores.Richard@epa.gov>  
**Sent:** Thursday, August 01, 2019 12:58 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** RE: Additional questions for Ethalpy

Marion,

have sent an email to Tom, trying to facilitate a data review with Enthalpy as soon as this week. Will discuss the idea of delaying the tests with Tom as soon as he replies back. Richard

---

**From:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Sent:** Thursday, August 01, 2019 12:24 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>  
**Subject:** FW: Additional questions for Ethalpy

Hi Richard,

Can you look at Peter's message below and let me know what you think about holding off on testing until we have these questions answered and can talk about an approach for testing the [redacted] again that helps us answer some of our outstanding questions in a methodical way (taking Libby's input into the mix too – I'm sorry I didn't think to invite her yesterday).

Let me know what you think.  
 Marion

---

**From:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Sent:** Thursday, August 01, 2019 10:36 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Rosati, Jacky <Rosati.Jacky@epa.gov>  
**Subject:** RE: Additional questions for Ethalpy

Marion,

I'm not going to setup the meeting with Enthalpy quite yet with the whole team. These are questions that I am going to need to see them in person and in their lab to answer. I think I will be able to answer all the questions after a discussion with them. I taking Ingrid, Doris, and Libby hopefully next week. We still need to look at the phase 3 results some more before we can really understand what the story is. This is something that Tom needs to setup since this is his project. I will keep you and Kat in the loop on the outcome of the meeting.

Thanks,

Peter

---

**From:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Sent:** Thursday, August 01, 2019 10:10 AM  
**To:** Kariher, Peter <[Kariher.Peter@epa.gov](mailto:Kariher.Peter@epa.gov)>  
**Subject:** RE: Additional questions for Ethalpy

Hey Peter, when you put the agenda together for the meeting with Enthalpy, you could list the agenda item for Chucks questions below under "Canister Pressurization data, Sample Flowrate, and Proportionality"

Cheers,  
Marion

---

**From:** Hoyer, Marion  
**Sent:** Thursday, August 01, 2019 7:36 AM  
**To:** Kariher, Peter <[Kariher.Peter@epa.gov](mailto:Kariher.Peter@epa.gov)>  
**Cc:** Walters, Charles <[walters.charles@epa.gov](mailto:walters.charles@epa.gov)>  
**Subject:** Additional questions for Ethalpy

Hi Peter,

Chuck's questions are below, highlighted in yellow.

Thanks so much for setting up the meeting with Enthalpy!

Marion

---

**From:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Sent:** Friday, July 26, 2019 1:10 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Cc:** Walters, Charles <[walters.charles@epa.gov](mailto:walters.charles@epa.gov)>; Fernandez, Antonio <[fernandez.antonio@epa.gov](mailto:fernandez.antonio@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>  
**Subject:** RE: F750 data review

Most of those questions will need to be posed to Enthalpy, but the can flow controllers were:

505 seconds ~ 670 ml/min  
1372 seconds ~ 180 ml/min  
1060 seconds ~ 180 ml/min

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Hoyer, Marion  
**Sent:** Friday, July 26, 2019 11:58 AM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Walters, Charles <[walters.charles@epa.gov](mailto:walters.charles@epa.gov)>; Fernandez, Antonio <[fernandez.antonio@epa.gov](mailto:fernandez.antonio@epa.gov)>; Laroo, Chris



<laroo.chris@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>

**Subject:** FW: F750 data review

Hi Tom,

Here are the questions Chuck has. Thanks for letting us know your thoughts.  
Marion

---

**From:** Walters, Charles

**Sent:** Thursday, July 25, 2019 10:54 AM

**To:** Cullen, Angela <cullen.angela@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>

**Subject:** F750 data review

All,

I reviewed the dyno data and Enthalpy report for the [REDACTED]. Since there are concerns with the EtO analysis; I only focused on canister sample collection and CO2 agreement. Here are my observations.

- The uncorrected bag CO2 vs canister CO2 agreed within 3% (see yellow areas in spreadsheet). This is significantly better than the [REDACTED] testing. I noticed that the vacuum decay in the canister was considerably smaller than the testing done on the [REDACTED]. The [REDACTED] final Pratios averaged 0.549; which is very near the 0.528 theoretical choked flow Pratio limit for an orifice. This would result in a more constant sample flow over the test phase providing a more representative sample over the phase. This could explain the better CO2 agreement in the F750 vs the [REDACTED] testing.
- Enthalpy presented the canister pressurization data differently for the [REDACTED] Ex. 9 Deliberative Process (DP). It would be helpful if the data presentation was consistent. Specifically, the [REDACTED] Ex. 4 CBI report provided controller flow data for "initial flow" and "return flow" whereas the [REDACTED] report did not. I assume the "return flow" is the flowrate recorded at the end of sample canister vacuum using an inert gas. This data is very helpful in determining final flow rate as a function of vacuum decay over the sample phase. The [REDACTED] flow data shows initial vs return flow to be very similar (as expected due to the ending Pratio very near the theoretical limit of 0.528 as discussed above). It would be nice to have this data for the [REDACTED] and any future testing.

#### Proposed questions to Enthalpy and/or ORD

Below are proposed questions to Enthalpy. These questions are designed to get a better understanding of the before and after state of the sample flow and perhaps influence the controller flow selected for the sample period. I know that this method is still considered qualitative; however, if it transitions to quantitative we will need a better handle on the sample flow and proportionality. I'm not sure if now is the right time to be asking these questions nor do I have a read on cost impacts in asking these questions. We should discuss.

- Is "initial flow" vs "return flow" available for the [REDACTED] (similar to the data presented on page 89 of the [REDACTED] report)?
- Can the "initial flow" vs "return flow" data be included in the report for any future testing?
- Is "return flow" measured at the "as received" canister vacuum?
- What nominal flow rate is selected for each sample period? 505s, 1372s, 1060s
- What nominal flow rate options are available?

Thanks,  
Chuck

Message

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**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 3/26/2019 3:12:53 PM  
**To:** McDonald, Joseph [mcdonald.joseph@epa.gov]  
**CC:** Michael Olechiw (olechiw.michael@epa.gov) [olechiw.michael@epa.gov]  
**Subject:** Ethylene Oxide **Ex. 5 Deliberative Process (DP)**

Hi Joe,

Mike probably told you that we are hoping you could call in for this meeting so that if Bill has questions about the NRMRL EtO testing on that LD GDI truck, you could fill him in as needed. I assume he'll just have some questions on the specs of the truck and other basic questions about the dyno testing there.


Are you open at this time Thursday morning?

-----  
**Subject:** Ethylene Oxide **Ex. 6 Personal Privacy (PP)**  
**Location:** AA-Room-Office-N66-ConfRoom/AA-OTAQ-OFFICE  
  
**Start:** Thu 3/28/2019 9:05 AM  
**End:** Thu 3/28/2019 9:55 AM  
  
**Recurrence:** (none)  
  
**Meeting Status:** Accepted  
  
**Organizer:** Charmley, William  
**Required Attendees:** Hoyer, Marion; Cook, Rich; Laroo, Chris; Geidosch, Justine; Joe McDonald (mcdonald.joseph@epa.gov); Michael Olechiw (olechiw.michael@epa.gov); Nelson, Brian; Cullen, Angela; Kathryn Sargeant (sargeant.kathryn@epa.gov)

## Message

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 6/4/2019 8:08:20 PM  
**To:** Storhok, Ines [storhok.ines@epa.gov]  
**CC:** Cullen, Angela [cullen.angela@epa.gov]; Sargeant, Kathryn [sargeant.kathryn@epa.gov]  
**Subject:** RE: Additional funds needed for Ethylene oxide analysis from mobile sources

Maybe it would be helpful if I try to explain more fully the stage we are at in this EtO evaluation. Our current focus is on getting some quick results from ORD both from their dyno test facility and, separately, their analysis lab. After we get testing up and running here in TATD, we will be relying on ORD more heavily for the analysis than the testing, I think and it will also mean that we need funds to invest in the facilities we have here to both bring the capability on-line to collect samples appropriately for this compound, as well as expenses for the testing (we don't have estimates of these costs yet).

ORD is already testing for us at their own expense, although we have sent  from ASD's budget to help support the very rapid work ORD initiated to get us quick answers to questions about whether mobile sources are or are not emitting this compound. They ORD dyno facility and analysis lab are not doing any work for OAQPS that I know of. My understanding is that OAQPS is investing with ORD on research-grade methods for analyzing ethylene oxide and this is not duplicative with our work which is using standard analysis methods.

ORD is doing this work in-house, although some of the dyno operation is conducted by in-house contractors.

For this initial phase of testing, I was anticipating that we would be shifting S&T funds to ORD to complete the work they committed to conducting.

I'm happy to help if there are more Qs.

Marion

---

**From:** Storhok, Ines  
**Sent:** Tuesday, June 04, 2019 2:58 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** FW: Additional funds needed for Ethylene oxide analysis from mobile sources

Marion – see questions from Haley below.  
 Can you give me some answers to respond?

Thanks,  
 Ines

---

**From:** Haley, Mike  
**Sent:** Tuesday, June 4, 2019 2:20 PM  
**To:** Storhok, Ines <storhok.ines@epa.gov>  
**Subject:** RE: Additional funds needed for Ethylene oxide analysis from mobile sources

Ines –

A couple of quick follow-up questions.

Is ORD ready to begin do the work/testing we need now? If not, how quickly can they get the work started?

Is ORD also doing any work for OAQPS on this issue that you know of?

Is this work ORD would be doing in-house, or would a contractor they have do the work?

Would we be "paying" for the work by providing them the actual funding? Or we would provide them our accounting information and they would just charge us? (Or we would put money on an existing contract they have?)

Any other info you might have on how this would work would be helpful?

Mike H.

---

**From:** Storhok, Ines

**Sent:** Thursday, May 30, 2019 11:45 AM

**To:** Haley, Mike <Haley.Mike@epa.gov>

**Cc:** Paff, Patricia <paff.patricia@epa.gov>

**Subject:** Additional funds needed for Ethylene oxide analysis from mobile sources

**Importance:** High

Mike – I'm not sure if you have been alerted to this issue, but OTAQ is pursuing analyses on a 'new' urgent issue related to ethylene oxide.

I believe Bill has alerted the SLT about this new need.

There is an urgent need for  for ORD work that needs to be done. Beyond that, we might have to come up again to request additional funding after more substantive conversations happen with TATD regarding in-house testing (nonroad and LD testing). Because the potential needs for this 'new' program could add up quickly, especially when we are talking about testing, I prefer to ask for additional funds than to try to absorb from other programs. Also, it seems that this program has the potential to become an urgent priority for the Agency. In 2020, we will most likely need to re-evaluate all of our programs/needs based on the budget levels that are available. For now, I want to make sure that we have the most urgent needs covered.

Would you be able to program an additional \$  for ASD now and we can decide later what else is needed?

Thanks,  
Ines

## Message

**From:** Cullen, Angela [cullen.angela@epa.gov]  
**Sent:** 7/30/2019 3:15:55 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]  
**CC:** Walters, Charles [walters.charles@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; McDonald, Joseph [McDonald.Joseph@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]  
**Subject:** RE: EtO Testing Status Update

Today's meeting will be a discussion with Bill, David, Matt, and Kathryn. I propose the following outline of items, but please let me know if you'd like to see other items:

- Results from [REDACTED] Diesel and concerns about quality
- Reinforce that we really are in the "developing the methods" stage
  - Kat/Bruce – Highlight the areas of concern with the analytical method (like you did in the Chem Lab last week)
  - Chuck – Highlight concerns with the sampling method in the canisters (non-proportional flow)
  - Meeting tomorrow with ORD to discuss concerns, follow-up with Enthalpy
- Update on the testing plan
  - [REDACTED] Ex. 5 Deliberative Process (DP) samples are at Enthalpy, likely a couple of weeks until we receive these results
  - [REDACTED] with EO sampling scheduled for next week, likely include additional spiked samples
  - Plan to discuss with ORD that we would like to repeat the [REDACTED] testing
  - HD Gasoline Truck
  - HD Diesel Truck
  - Chuck – update on NR testing at NVFEL

-----Original Appointment-----

**From:** Charmley, William <charmley.william@epa.gov>  
**Sent:** Monday, June 03, 2019 2:27 PM  
**To:** Charmley, William; Sargeant, Kathryn; Hoyer, Marion; Cullen, Angela; Haugen, David  
**Cc:** Brusstar, Matt; Walters, Charles; Kolowich, Bruce; Nelson, Brian; Olechiw, Michael; Cook, Rich; Loftis, Kathy; Fernandez, Antonio; McDonald, Joseph; Laroo, Chris; Shores, Richard  
**Subject:** EtO Testing Status Update  
**When:** Tuesday, July 30, 2019 3:05 PM-3:55 PM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** N158

## Message

**From:** Walters, Charles [walters.charles@epa.gov]  
**Sent:** 6/24/2019 11:00:39 AM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Imfeld, Sterling [imfeld.sterling@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]  
**Subject:** nonroad SI EtO testing

Team,

For the nonroad SI EtO test discussion meeting this afternoon.

**Proposed Engines:**

**Ex. 5 Deliberative Process (DP)**

Both engines are Nonhandheld, carbureted, and uncatalyzed and are EPA-owned. At 14 kW, the horizontal is in the upper range of NRSI (defined as 19 kW or less). The vertical engine would allow similar dilution using the site's smallest venturi (350 scfm).

**Next Steps for Prepping Cell for Summa Canisters**

For Nonhandheld, the test is a 6-mode, weighted steady state test. So this would require 6 canisters per test (7 if we include background).

For discussion

- Do we want to run the 6 mode test?
- Or run a representative mode? (If so, I would propose mode 3 at 50% load or mode 4, at 25% load as these modes have the heaviest weighting at 0.29, 0.30 respectively)
- E0 and E10?
- Are we interested in background? **Ex. 4 CBI** tests were below DL)
- Are we interested in criteria emissions?
- Canister and Controller Availability
- Sample Analysis
- Sample Line and Probe
- Nonroad SI compliance season (starts in August)

Thanks,  
 Chuck

Message

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**From:** Cook, Rich [Cook.Rich@epa.gov]  
**Sent:** 6/18/2019 2:23:35 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]; Hays, Michael [Hays.Michael@epa.gov]  
**CC:** Hoyer, Marion [hoyer.marion@epa.gov]  
**Subject:** RE: [REDACTED] for EtO Testing

We added the other [REDACTED] needed to this so it will come to [REDACTED] \$K.

In addition, the [REDACTED] incremental funding on Jacobs contract EP-C-15-008, work assignment 4-005, to upgrade equipment in the chem lab, was committed last week. The [REDACTED] is expiring end of year \$\$\$.

Rich Cook  
Health Effects, Benefits, and Air Toxics Center  
Assessment and Standards Division  
Office of Transportation and Air Quality  
U. S. Environmental Protection Agency  
(734)214-4827

---

**From:** Cook, Rich  
**Sent:** Monday, June 17, 2019 3:03 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Marion Hoyer <Hoyer.Marion@epa.gov>  
**Subject:** 200K PR for EtO Testing

I just found out this one did not go out. Our folks are working on it right now so we can get it to you ASAP. Sorry about that.

Rich Cook  
Health Effects, Benefits, and Air Toxics Center  
Assessment and Standards Division  
Office of Transportation and Air Quality  
U. S. Environmental Protection Agency  
(734)214-4827



## Message

**From:** McDonald, Joseph [McDonald.Joseph@epa.gov]  
**Sent:** 6/10/2019 7:18:29 PM  
**To:** Nelson, Brian [nelson.brian@epa.gov]  
**CC:** Hoyer, Marion [hoyer.marion@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; Bryson, James [bryson.james@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]  
**Subject:** Re: Honda Accord V6 -- EtO: quick report-out on trip to NRMRL (sampling into summa canisters and discussions with Ingrid on analysis)

Also the pre-Ex. 5 Deliberative Process (DP) with the base 4-cylinder and optional V6, with perhaps a bit larger sales volume than the Accord. Far away from my desk right now, but I have the emissions families saved from one of the LD GHG analyses.

Joseph McDonald  
Senior Engineer

U.S. EPA  
ORD/NRMRL & OAR/OTAQ  
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26 W. Martin Luther King Dr.  
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Telephone (USA): 513-569-7421  
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On Jun 10, 2019, at 1:12 PM, Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)> wrote:

It looks like a pre-Ex. 5 Deliberative Process (DP) could be a good PFI candidate:

# Ex. 5 Deliberative Process (DP)

-----Original Appointment-----

**From:** Hoyer, Marion

**Sent:** Sunday, June 9, 2019 5:25 PM

**To:** Hoyer, Marion; Laroo, Chris; Geidosch, Justine; Cullen, Angela; Cook, Rich; Fernandez, Antonio; Olechiw, Michael; Nelson, Brian; Walters, Charles; Baldauf, Richard; Bryson, James; McDonald, Joseph; Loftis, Kathy

**Subject:** EtO: quick report-out on trip to NRMRL (sampling into summa canisters and discussions with Ingrid on analysis)

**When:** Monday, June 10, 2019 12:00 PM-12:30 PM (UTC-05:00) Eastern Time (US & Canada).

**Where:** AA-Room-Office-S109-ConfRoom/AA-OTAO-OFFICE

I apologize not everyone can make this time.

Kat – we will get to catch up with you later in the week; Angela has scheduled a time to talk about analysis of EtO.

## Message

**From:** Cook, Rich [Cook.Rich@epa.gov]  
**Sent:** 5/17/2019 3:57:07 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]  
**Subject:** FW: NRMRL EtO Method Status

This is what I have on the near road EtO measurement work. Is there other e-mail correspondence I do not have?

Rich Cook  
 Health Effects, Benefits, and Air Toxics Center  
 Assessment and Standards Division  
 Office of Transportation and Air Quality  
 U. S. Environmental Protection Agency  
 (734)214-4827

---

**From:** Baldauf, Richard  
**Sent:** Wednesday, May 15, 2019 8:18 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>  
**Subject:** RE: NRMRL EtO Method Status

Sure, I can check with them if they're aware of who's collecting ambient samples. Would imagine the near road site in RTP would be one of the sites, but will try to confirm

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, May 15, 2019 8:01 PM  
**To:** Baldauf, Richard <Baldauf.Richard@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>  
**Subject:** FW: NRMRL EtO Method Status

Rich B – see Justine's note below about some NR samples being collected for EO in RTP this summer. I will ask Lew about this, but could you look into who might be doing this?

## Ex. 5 Deliberative Process (DP)

**From:** Cook, Rich  
**Sent:** Wednesday, May 15, 2019 5:33 PM  
**To:** Geidosch, Justine <Geidosch.Justine@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>  
**Subject:** RE: NRMRL EtO Method Status

Maybe we can use this issue as leverage to educate ORD senior management on the need for investments in their lab facilities.

Rich Cook  
 Health Effects, Benefits, and Air Toxics Center  
 Assessment and Standards Division  
 Office of Transportation and Air Quality  
 U. S. Environmental Protection Agency  
 (734)214-4827

---

**From:** Geidosch, Justine  
**Sent:** Wednesday, May 15, 2019 5:21 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>  
**Cc:** Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>  
**Subject:** NRMRL EtO Method Status

I spoke with Ingrid George this afternoon about her work on developing the method for measuring EtO. She is still working on getting the method up and running; sounds like she has a bit more tweaking to get confidence in her method, but that she thinks they can get it working soon. She's been working with ambient samples to make sure she has the method down before she moves to working on exhaust samples.

They are planning on pulling ambient samples from two different sites this Summer and having her measure the EtO. Both are around RTP – one is a near roadway site and the other is more remote. I believe Ingrid said she was working with OAQPS on this, but I could be wrong about that.

She also mentioned that she needs to do some significant upgrades to her instrumentation to be able to get detection limits that are comparable to the contract labs. Ingrid's current equipment isn't optimized for EtO, and while the GCs she has are capable of doing the analysis, she needs upgrades, likely a new preconcentrator setup. She estimates it will cost about [REDACTED] to get the instrument to where is need to be for the best analysis. Also on the funding front, she needs a set of summa canisters that are better for EtO than the ones she uses for TO-15. I guess she has one or two cans, but would need a full set to do a good amount of dyno sampling. She thinks it would cost about [REDACTED] for a set of 20. I told her I would check if OTAQ would be able to contribute any funding towards moving the analysis in house, so let me know if you have any thoughts.

Overall, got the impression that she is pretty confident in her ability to make the measurements, but doesn't think she'll be able to get to as low detection limits as we've seen from the contract labs without investing some money in the setup. Let me know if there are any additional questions you want me to look into.

Thanks,  
Justine

Justine Geidosch  
Physical Scientist, Assessment and Standards Division  
Office of Transportation and Air Quality  
US Environmental Protection Agency

Ph: (734) 214-4923  
[geidosch.justine@epa.gov](mailto:geidosch.justine@epa.gov)

## Message

**From:** Cullen, Angela [cullen.angela@epa.gov]  
**Sent:** 6/17/2019 1:38:11 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Shores, Richard [Shores.Richard@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]  
**Subject:** RE: Dyno Testing in RTP

Hi Tom,

I have two requests for you. First, would you please share the dyno test results from the   testing done a few weeks ago with us? We want to be sure the vehicle was running "normal."

My second request is, if possible, could we please see your QAPP that covers this testing? If not, will you please confirm this testing is completed under a QAPP?

Thank you for all of your help and work with this!  
 Angela

---

**From:** Long, Thomas  
**Sent:** Thursday, June 13, 2019 12:05 PM  
**To:** Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

For the PFI, we have on hand a Ex. 5 Deliberative Process (DP) It is a flex fuel vehicle. Do you still want us to use Tier 3 E10 or would you like us to use E85 from the pump? Using this vehicle would save us the cost of leasing a vehicle.

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Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Cullen, Angela  
**Sent:** Friday, May 17, 2019 3:04 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Richard and Tom,

Thank you for our discussions this week and your work on this project. This email is to circle back with what we discussed yesterday. Our near-term priorities are:

1.   GDI, normal test conditions - completed
2.   diesel, normal test conditions, with cold-start UDDS and warm UDDS cycles

3. TBD LD gasoline vehicle (PFI, naturally-aspirated, Tier 2 or Tier 3 certification level, significant sales volume), E10 fuel, FTP cycle, normal test conditions
4. ☐ GDI, normal test conditions, Tier 2 certification fuel or market E0 fuel, FTP cycle

The other testing suggestions you sent are still important, but we want to first scope out which mobile source sectors emit EtO. We will be having discussions with our lab early next week to explore what we can do to test nonroad engines.

When you get a chance, would you please send a picture of the F750 emission control label?

Thank you,  
Angela

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, May 15, 2019 4:38 PM  
**To:** Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Cc:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>  
**Subject:** RE: Dyno Testing in RTP

Hi Richard,

I just made it back to my phone. I can call you if that would be helpful.

This is an excellent list of some of the top priorities as we see them too. Given the urgency around getting some initial/screening diesel data it might make sense to start there and then meet next week to discuss further testing with Angela and our light-duty center director, Mike Olechiw.

For the testing next week on the diesel can you run both a cold and warm cycle? I am not a testing expert so I've cc'd Angela as this is her area of expertise. If at all possible, this testing is the current highest priority.

We will start the PR for ☐ so that we can get funds supporting this work ASAP. I am confident we can send additional funds in June or July. Since we'll figure that out as we go, it sounds from your note like that kind of incremental funding situation could work, but we can discuss this further.

After we get a chance to orient Bill Charmley, our division director, to the results tomorrow, we will be setting up recurring meetings with him and we will invite you to those recurring meetings so that he can also hear from you directly and we can be discussing next steps in real time together.

I honestly cannot thank you enough not only for making this work your top priority, but the fact that you are generating the highest quality data possible in this emerging issue that has many complexities, is extraordinarily commendable.

Thank you!  
Marion

---

**From:** Shores, Richard  
**Sent:** Wednesday, May 15, 2019 4:01 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Cc:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Subject:** Dyno Testing in RTP

Marion,

After some discussion with Tom, we have come up with a preliminary strategy for the testing that could be possible. Keep in mind that vehicle testing typically costs us \$30k, including the rental and no EtO testing. This last round of EtO testing costs us ☐. We are considering the following tests/vehicles.

1. ☐ GDI, normal test conditions completed

2. [REDACTED] diesel, maybe start next week without integrated modal HC data
3. Class 8 diesel, should have integrated modal HC data being recorded
4. PFI, gas, considering the idea of two tests, normal and cold test conditions
5. [REDACTED] GDI, cold test conditions
6. TBU vehicle, possible some pre/post catalyst sampling with canisters only?

Notice we are suggesting cold condition testing, what do you think? This data set in completion should go a long way to defining if the mobile source emissions are a significant component of the inventory. Our testing programs are typically buffered with time, allowing us the opportunity to leverage other project resources but more importantly the time we have available for those primarily responsible for the dyno operation. Given our need to collect data at an accelerated schedule translates into additional contractor support and additional costs. Given all the variables here and understanding that every test we conduct may cause us to change direction, my suggestion is to start the [REDACTED] testing as soon as we can, with or without a continuous HC monitor. Testing the vehicles listed above is assumed to cost more than [REDACTED] but if you have that available, maybe we (ORD) can cover the additional costs. As this sampling occurs, we can keep in touch on the budget, specifically what the testing actually costs. Ultimately, we would like to complete the testing above with the funds available.

Richard Shores  
 U.S. Environmental Protection Agency (E343-02)  
 Office of Research and Development  
 National Risk Management Research Laboratory  
 Air and Energy Management Division  
 Distributed Source & Buildings Branch  
 Research Triangle Park, NC27711, USA  
 Phone: (919) 541-4983  
 email: [shores.richard@epa.gov](mailto:shores.richard@epa.gov)

## Message

**From:** Storhok, Ines [storhok.ines@epa.gov]  
**Sent:** 6/10/2019 4:03:30 PM  
**To:** Charmley, William [charmley.william@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]; Haugen, David [haugen.david@epa.gov]  
**CC:** Sargeant, Kathryn [sargeant.kathryn@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; McDonald, Joseph [McDonald.Joseph@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Bryson, James [bryson.james@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]  
**Subject:** RE: Update on mobile source EtO testing and related issues

Bill – I reached to Haley last week already on the specific short-term request. Mike is working on it. I also highlighted to Haley that this program most likely will expand and additional resources will be needed beyond the specific request, including potential work involving TATD. Mike understood and I told him that we will keep him posted on further work and funding needs.

Thanks,  
 Ines

---

**From:** Charmley, William  
**Sent:** Monday, June 10, 2019 10:39 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Haugen, David <haugen.david@epa.gov>; Storhok, Ines <storhok.ines@epa.gov>  
**Cc:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Bryson, James <bryson.james@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>  
**Subject:** RE: Update on mobile source EtO testing and related issues

Dear Marion (and everyone),

Thank you for this update. Three questions.

- 1) Ines – please let David and I know if you need us to do any outreach to Mike Haley or Lee regarding the funding request for the analytical equipment
- 2) Regarding the Phase 3 (June 17) vehicle, what type of guidance is OTAQ giving to ORD regarding the selection of the pfi vehicle? Recent model year? Engine family with super high sales? Well maintained? Low, medium, high mileage?
- 3) Regarding the fuel for the Phase 3 testing (June 17 week). I know that we must have discussed the potential for an E0 testing for Phase 3, in addition to the Tier 3 E10 fuel. What is the thinking on for this vehicle, testing only on a Tier 3 certification gasoline, and not also adding to the testing a Tier 2, E0 test fuel?

Thanks



Bill

**From:** Hoyer, Marion

**Sent:** Monday, June 10, 2019 9:28 AM

**To:** Charmley, William <charmley.william@epa.gov>; Haugen, David <haugen.david@epa.gov>

**Cc:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Bryson, James <bryson.james@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>

**Subject:** Update on mobile source EtO testing and related issues

Bill and David,

We are on your calendars for June 27 to give you an update on ethylene oxide and discuss ongoing work and plans. Since we had to cancel this week's in-person update, we've briefly summarized highlights below.

■ NRMRL is finishing initial emissions testing for EtO from a [REDACTED] diesel truck this week ("Phase 2" test noted in the list below). We should have results in 3-4 weeks. NRMRL is moving down this list of vehicles to test in sequential order. We are talking about adding a HD gasoline truck after the Class 8 diesel (into July).

■ Three people from OTAQ (Chris Laroo, Kat Loftis, and Jim Bryson ) visited the NRMRL facility last Wednesday to learn about their sampling methods so that we can set up sampling into summa canisters here at NVFEL. We are meeting weekly to talk about next steps with regard to sampling here and priorities for the testing we'll be conducting.

■ Ines is working with Mike Haley to see if the IO can fund a [REDACTED] purchase of analytical equipment so that ORD can bring an analytical method on-line this summer/fall that is equivalent to the method used by the contractor we are currently using. This will provide the analysis capability we will need as we start to generate samples at NVFEL and continue to test in NRMRL. We are also talking with Bruce and Kat about the analytical methods they are evaluating.

Let us know if you have questions.

#### Phase 1 (Complete)

Source: Light-duty SI vehicle ([REDACTED] Ex. 3 Deliberative Process (DP)) GDI)

#### Phase 2 (June 3)

Vehicle: 2011 [REDACTED] Ex. 3 Deliberative Process (DP) Regular Cab, [REDACTED] Ex. 5 Deliberative Process (DP), Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

#### Phase 3 (June 17)

Vehicle: A common naturally aspirated PFI light-duty vehicle

Fuel: Tier 3 E10 cert fuel

#### Phase 4 (June 24 or July 8)

Vehicle: [REDACTED] Ex. 5 Deliberative Process (DP) Turbocharged GDI 2.7L (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

#### Phase 5 (tbd)

Vehicle: Class 8 HDDT

Message

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**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 5/31/2019 11:36:06 AM  
**To:** McDonald, Joseph [McDonald.Joseph@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]  
**CC:** Cullen, Angela [cullen.angela@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Sanchez, James [sanchez.james@epa.gov]  
**Subject:** RE: Multi-phase EtO Study

Joe,

The SCR is upstream of the DPF.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

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**From:** McDonald, Joseph  
**Sent:** Thursday, May 30, 2019 7:47 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Sanchez, James <sanchez.james@epa.gov>  
**Subject:** Re: Multi-phase EtO Study

Tom,

Can you confirm the order of the devices in the catalyst system? Is the DPF positioned upstream or downstream of the SCR substrate? It does make a difference with respect to some air toxic emissions. You can determine the SCR position from the location of the urea (aka DEF) injector. SCR is always positioned immediately after the urea injector. The DPF can be visually identified from the plugs on alternating channels on either the inlet or outlet if you can get visual access to either side.

Thanks,

Joe

Regards,

Joe

Joseph McDonald  
Senior Engineer

U.S. EPA

ORD/NRMRL & OAR/OTAO

Mail Stop: 236

26 W. Martin Luther King Dr.  
Cincinnati, Ohio 45268 USA

Telephone (USA): 513-569-7421

Cellular Telephone: 513-316-2380

E-mail: mcdonald.joseph@epa.gov

On May 30, 2019, at 6:24 PM, Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)> wrote:

Hi Tom,

I apologize for my slow response on this!! I thought I had replied and realized today that I hadn't.

This all sounds good to me, but I am not the emission testing guru so I'm sure others would pipe up if they have suggestions or questions.

When you get to the Phase 3 testing on the second LDGV vehicle running on E10, let's touch base so we agree on the vehicle to test. We had a conversation here yesterday and there are some options we have for vehicles we could send to you if you don't have some ready options there.

Will Phase 5 be the HDDT that you'll be acquiring for the CTI testing that James Sanchez and you have been discussing?

I'll be in touch separately on funds.  
Marion

---

**From:** Long, Thomas

**Sent:** Tuesday, May 21, 2019 12:31 PM

**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>

**Cc:** Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>; Geidosch, Justine <[Geidosch.Justine@epa.gov](mailto:Geidosch.Justine@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; McDonald, Joseph <[McDonald.Joseph@epa.gov](mailto:McDonald.Joseph@epa.gov)>; Baldauf, Richard <[Baldauf.Richard@epa.gov](mailto:Baldauf.Richard@epa.gov)>

**Subject:** Multi-phase EtO Study

Marion and Angela,

We are having a communication issue with one of our instruments in the lab which is delaying our ability to complete pre-test calibrations. Also, we have a key technician with a vacation scheduled for next week. We would like to postpone the testing to make sure we have experienced personnel at every position and have adequately confirmed our calibration requirements.

I am still waiting to hear about the THC analyzer. The have begun the evaluation but have not completed a diagnosis at which point we can evaluate the value of an expedited repair. I am also waiting to get a quote from Enthalpy which is due today.

I need to submit a Performance Work Statement mod and QAPP addendum for this work. Would you mind reviewing the tentative plan and schedule below and either confirm that this meets your requirements or recommend modifications? (There is probably more detail than you want about controllers, but I want to keep it all straight in my own mind as well.)

**Phase 1 (Complete)**

Source: Light-duty SI vehicle

Dilution: Can 0098 was 30.16:1; Can 0080 was 18.99:1; Can 0001 was 21.18:1. The dilution ratio varied during Cans 0728, 0039, and 0066 in the range of 26:1.

**Phase 2 (June 3)**

Vehicle: 2011 Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked → 15 total

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

**Phase 3 (June 17)**

Vehicle: A common naturally aspirated PFI light-duty vehicle

Fuel: Tier 3 E10 cert fuel

Lab: Light-duty dynamometer facility.

Sampling days: 3

Driving schedules: FTP75 and Supplemental FTP.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

Controllers required:

1 controller per day for cold start transient, source, 505 seconds.

1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds

2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds

1 controller per day for source, US06, 596 seconds.

2 controllers for background ambient per day, 1372 seconds

2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

**Phase 4 (June 24 or July 8)**

Vehicle: 2016 Ex. 5 Deliberative Process (DP) Turbocharged GDI 2.7L (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the ~~FTP75~~; and the 596 second – 8.01 mile transient US06.

Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

Controllers required:

1 controller per day for cold start transient, source, 505 seconds.

1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds

2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds

1 controller per day for source, US06, 596 seconds.

2 controllers for background ambient per day, 1372 seconds

2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

Message

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**From:** Laroo, Chris [laroo.chris@epa.gov]  
**Sent:** 4/3/2019 7:50:11 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]  
**CC:** Geidosch, Justine [Geidosch.Justine@epa.gov]  
**Subject:** RE: Ethylene Oxide in Mobile Source Exhaust

Actually I did have it. I just forgot.....I apologize. I work on so many different things that I can't remember things from a few weeks back.

I was trying to see what NOx standard the gen set was certified to. Assuming this is MY 2014 or later and based on Tiffany saying it was certified to Tier 4, the standard for NOx is 0.67 g/kW-hr or 0.8 g/kW-hr FEL. So not as dirty w/rpt NOx as I would have thought, but it is still up there. I was trying gauge how much of an improvement you could gain w/rpt to contamination of the pre-concentrator for a lower NOx engine or vehicle. I would expect a passenger car to be at least 6 or 7 X lower on average. That should help.

Part 60 subpart IIII, 60.4201, takes you to 1039.101 to determine the standard you must comply with. I got the limit from Table 1 for generators 130 kW < 560 kW. Link is here: [https://www.ecfr.gov/cgi-bin/text-idx?SID=86a7bfb1ef009655beb4c65b4d81abee&mc=true&node=se40.36.1039\\_1101&rtn=div8](https://www.ecfr.gov/cgi-bin/text-idx?SID=86a7bfb1ef009655beb4c65b4d81abee&mc=true&node=se40.36.1039_1101&rtn=div8)

Regards,

Chris Laroo  
 Environmental Protection Specialist  
 US Environmental Protection Agency  
 Office of Transportation and Air Quality  
 Assessment and Standards Division  
 2000 Traverwood Dr.  
 Ann Arbor, MI 48105  
 (734) 214-4937  
 (734) 214-4055 (fax)  
 Email: laroo.chris@epa.gov

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, April 03, 2019 3:17 PM  
**To:** Cullen, Angela <cullen.angela@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>  
**Subject:** FW: Ethylene Oxide in Mobile Source Exhaust

I am realizing I forgot to fold you into this email chain when it turned into a discussion on the NRMRL dyno testing for EtO.

Also attached is the spec sheet Tiffany sent me for the engine she reported today did not have EtO in the exhaust.

---

**From:** Yelverton, Tiffany  
**Sent:** Thursday, March 21, 2019 8:48 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Hays, Michael <Hays.Michael@epa.gov>; George, Ingrid <George.Ingrid@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>  
**Subject:** RE: Ethylene Oxide in Mobile Source Exhaust

Hello All,

A couple questions/things to consider:

## Ex. 5 Deliberative Process (DP)

Good luck!  
tiffany

---

Tiffany L. B. Yelverton, Ph.D.  
Mechanical Engineer  
Stationary Source Branch  
Office of Research & Development  
U. S. Environmental Protection Agency  
109 T. W. Alexander Drive (E305-01)  
Research Triangle Park, NC 27711

919.541.9456 (office)  
919.541.0554 (fax)

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, March 20, 2019 5:08 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>; Hays, Michael <[Hays.Michael@epa.gov](mailto:Hays.Michael@epa.gov)>; George, Ingrid <[George.Ingrid@epa.gov](mailto:George.Ingrid@epa.gov)>  
**Cc:** Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Geidosch, Justine <[Geidosch.Justine@epa.gov](mailto:Geidosch.Justine@epa.gov)>; Yelverton, Tiffany <[Yelverton.Tiffany@epa.gov](mailto:Yelverton.Tiffany@epa.gov)>  
**Subject:** RE: Ethylene Oxide in Mobile Source Exhaust

Hi Tom,

I can't thank you enough for tracking down the details so quickly. From my uneducated viewing place, the detection limits seem ok, but Tiffany is the only one among us who has first-hand experience to bring to bear here and I have cc'd her so we can keep her in the loop as you plan out the LD GDI truck testing and sample analysis.

Tiffany – do you have some insights to offer or any guidance here?

Rich put some time on calendars to discuss the testing the week after next. Will that give us time to discuss the dyno testing plan?

Thanks,  
Marion

---

**From:** Long, Thomas  
**Sent:** Wednesday, March 20, 2019 2:03 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Hays, Michael <[Hays.Michael@epa.gov](mailto:Hays.Michael@epa.gov)>; George, Ingrid <[George.Ingrid@epa.gov](mailto:George.Ingrid@epa.gov)>  
**Cc:** Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Geidosch, Justine <[Geidosch.Justine@epa.gov](mailto:Geidosch.Justine@epa.gov)>  
**Subject:** RE: Ethylene Oxide in Mobile Source Exhaust

Are these analyses adequate?

Ethylene oxide, 120ppt analysis
TO-15, 1ppb analysis
EPA Method 3C
Canister and Controller rental

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Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Hoyer, Marion  
**Sent:** Tuesday, March 19, 2019 2:28 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>; Hays, Michael <[Hays.Michael@epa.gov](mailto:Hays.Michael@epa.gov)>; George, Ingrid <[George.Ingrid@epa.gov](mailto:George.Ingrid@epa.gov)>  
**Cc:** Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Geidosch, Justine <[Geidosch.Justine@epa.gov](mailto:Geidosch.Justine@epa.gov)>  
**Subject:** Ethylene Oxide in Mobile Source Exhaust

Here is the paper that Rich mentioned that reports EtO in mobile exhaust



## Message

**From:** Cullen, Angela [cullen.angela@epa.gov]  
**Sent:** 6/13/2019 8:35:02 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; McDonald, Joseph [McDonald.Joseph@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]  
**CC:** Cook, Rich [Cook.Rich@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]; Sargeant, Kathryn [sargeant.kathryn@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]  
**Subject:** RE: Dyno Testing in RTP

I am confirming – we agree that the suggested 2013MY Ex. 5 Deliberative Process (DP) should be the next vehicle tested. It is a good representation of a typical PFI vehicle. We also want to only test on E10 for this next test with this vehicle.

Thank you all!  
 Angela

---

**From:** Hoyer, Marion  
**Sent:** Thursday, June 13, 2019 2:28 PM  
**To:** McDonald, Joseph <McDonald.Joseph@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

My understanding is we'll will chase down fuel-related EtO issues at a later time if we find differences between E0 and E10. Let's hold on E15 until we learn more.

---

**From:** McDonald, Joseph  
**Sent:** Thursday, June 13, 2019 2:12 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Is there any E15 usage in Illinois? An FFV would be OK on E15 if we wanted to take a look at E0, E10, and E15. That would give a range of fuels and E15 is getting a summer waiver.

---

**From:** Hoyer, Marion  
**Sent:** Thursday, June 13, 2019 2:00 PM  
**To:** McDonald, Joseph <McDonald.Joseph@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Fernandez, Antonio

<fernandez.antonio@epa.gov>

**Subject:** RE: Dyno Testing in RTP

In terms of the fuel, we would like E10 cert fuel and not E85. Angela can confirm.

Thanks Tom!

---

**From:** McDonald, Joseph

**Sent:** Thursday, June 13, 2019 1:28 PM

**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>

**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>

**Subject:** RE: Dyno Testing in RTP

It's a data point. It might be good to test something newer, but it was relatively high volume six years ago. In general, we should probably look at certification data and projected volume and test a number of vehicles that are segment leading. The Caravan has been a segment leader.

-Joe

---

**From:** Hoyer, Marion

**Sent:** Thursday, June 13, 2019 12:54 PM

**To:** Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>

**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>

**Subject:** RE: Dyno Testing in RTP

I'm just folding in Tony and Joe M with this email.

---

**From:** Long, Thomas

**Sent:** Thursday, June 13, 2019 12:05 PM

**To:** Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>

**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>

**Subject:** RE: Dyno Testing in RTP

For the PFI, we have on hand a Ex. 5 Deliberative Process (DP) It is a flex fuel vehicle. Do you still want us to use Tier 3 E10 or would you like us to use E85 from the pump? Using this vehicle would save us the cost of leasing a vehicle.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Cullen, Angela

**Sent:** Friday, May 17, 2019 3:04 PM




**To:** Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>

**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>


**Subject:** RE: Dyno Testing in RTP

Richard and Tom,

Thank you for our discussions this week and your work on this project. This email is to circle back with what we discussed yesterday. Our near-term priorities are:

1.  GDI, normal test conditions - completed
2.  diesel, normal test conditions, with cold-start UDDS and warm UDDS cycles
3. TBD LD gasoline vehicle (PFI, naturally-aspirated, Tier 2 or Tier 3 certification level, significant sales volume), E10 fuel, FTP cycle, normal test conditions
4.  GDI, normal test conditions, Tier 2 certification fuel or market E0 fuel, FTP cycle

The other testing suggestions you sent are still important, but we want to first scope out which mobile source sectors emit EtO. We will be having discussions with our lab early next week to explore what we can do to test nonroad engines.

When you get a chance, would you please send a picture of the  emission control label?

Thank you,  
Angela

---

**From:** Hoyer, Marion

**Sent:** Wednesday, May 15, 2019 4:38 PM

**To:** Shores, Richard <Shores.Richard@epa.gov>

**Cc:** Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>


**Subject:** RE: Dyno Testing in RTP

Hi Richard,

I just made it back to my phone. I can call you if that would be helpful.

This is an excellent list of some of the top priorities as we see them too. Given the urgency around getting some initial/screening diesel data it might make sense to start there and then meet next week to discuss further testing with Angela and our light-duty center director, Mike Olechiw.

For the testing next week on the diesel can you run both a cold and warm cycle? I am not a testing expert so I've cc'd Angela as this is her area of expertise. If at all possible, this testing is the current highest priority.

We will start the PR for  so that we can get funds supporting this work ASAP. I am confident we can send additional funds in June or July. Since we'll figure that out as we go, it sounds from your note like that kind of incremental funding situation could work, but we can discuss this further.

After we get a chance to orient Bill Charmley, our division director, to the results tomorrow, we will be setting up recurring meetings with him and we will invite you to those recurring meetings so that he can also hear from you directly and we can be discussing next steps in real time together.

I honestly cannot thank you enough not only for making this work your top priority, but the fact that you are generating the highest quality data possible in this emerging issue that has many complexities, is extraordinarily commendable.

Thank you!  
Marion

---

**From:** Shores, Richard  
**Sent:** Wednesday, May 15, 2019 4:01 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Cc:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Subject:** Dyno Testing in RTP

Marion,

After some discussion with Tom, we have come up with a preliminary strategy for the testing that could be possible. Keep in mind that vehicle testing typically costs us [REDACTED] including the rental and no EtO testing. This last round of EtO testing costs us [REDACTED]. We are considering the following tests/vehicles.

1. [REDACTED] GDI, normal test conditions completed
2. [REDACTED] diesel, maybe start next week without integrated modal HC data
3. Class 8 diesel, should have integrated modal HC data being recorded
4. PFI, gas, considering the idea of two tests, normal and cold test conditions
5. [REDACTED], GDI, cold test conditions
6. TBD vehicle, possible some pre/post catalyst sampling with canisters only?

Notice we are suggesting cold condition testing, what do you think? This data set in completion should go a long way to defining if the mobile source emissions are a significant component of the inventory. Our testing programs are typically buffered with time, allowing us the opportunity to leverage other project resources but more importantly the time we have available for those primarily responsible for the dyno operation. Given our need to collect data at an accelerated schedule translates into additional contractor support and additional costs. Given all the variables here and understanding that every test we conduct may cause us to change direction, my suggestion is to start the [REDACTED] testing as soon as we can, with or without a continuous HC monitor. Testing the vehicles listed above is assumed to cost more than [REDACTED] but if you have that available, maybe we (ORD) can cover the additional costs. As this sampling occurs, we can keep in touch on the budget, specifically what the testing actually costs. Ultimately, we would like to complete the testing above with the funds available.

Richard Shores  
 U.S. Environmental Protection Agency (E343-02)  
 Office of Research and Development  
 National Risk Management Research Laboratory  
 Air and Energy Management Division  
 Distributed Source & Buildings Branch  
 Research Triangle Park, NC27711, USA  
 Phone: (919) 541-4983  
 email: [shores.richard@epa.gov](mailto:shores.richard@epa.gov)

## Message

**From:** Fernandez, Antonio [fernandez.antonio@epa.gov]  
**Sent:** 6/13/2019 5:58:48 PM  
**To:** McDonald, Joseph [McDonald.Joseph@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]  
**CC:** Cook, Rich [Cook.Rich@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]; Sargeant, Kathryn [sargeant.kathryn@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]  
**Subject:** RE: Dyno Testing in RTP

I think the van is fine for a PFI engine of any vintage in the last decade. It has an engine and emission control system representative of a lot of similar cars and crossovers with PFI for lots of years. The FFV part shouldn't make a difference for E0 or E10 and I don't know if we are requesting E85 results at this stage (Angela??). It is a good volume seller that is purchased by many fleets and families to move multiple passengers so anything emitted out of the exhaust is representative of potential exposure to a lot of the population.

My 2 cents.

Tony

---

**From:** McDonald, Joseph  
**Sent:** Thursday, June 13, 2019 1:28 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

It's a data point. It might be good to test something newer, but it was relatively high volume six years ago. In general, we should probably look at certification data and projected volume and test a number of vehicles that are segment leading. The Ex. 5 Collaborative Process (CP) has been a segment leader.

-Joe

---

**From:** Hoyer, Marion  
**Sent:** Thursday, June 13, 2019 12:54 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

I'm just folding in Tony and Joe M with this email.

---

**From:** Long, Thomas  
**Sent:** Thursday, June 13, 2019 12:05 PM  
**To:** Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>

**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

For the PFI, we have on hand a 2013 Ex. 5 Deliberative Process (DP) It is a flex fuel vehicle. Do you still want us to use Tier 3 E10 or would you like us to use E85 from the pump? Using this vehicle would save us the cost of leasing a vehicle.

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Cullen, Angela  
**Sent:** Friday, May 17, 2019 3:04 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Richard and Tom,

Thank you for our discussions this week and your work on this project. This email is to circle back with what we discussed yesterday. Our near-term priorities are:

1. Ex. 5 Deliberative Process (DP) GDI, normal test conditions - completed
2. Ex. 5 Deliberative Process (DP) diesel, normal test conditions, with cold-start UDDS and warm UDDS cycles
3. TBD LD gasoline vehicle (PFI, naturally-aspirated, Tier 2 or Tier 3 certification level, significant sales volume), E10 fuel, FTP cycle, normal test conditions
4. Ex. 5 Deliberative Process (DP) GDI, normal test conditions, Tier 2 certification fuel or market E0 fuel, FTP cycle

The other testing suggestions you sent are still important, but we want to first scope out which mobile source sectors emit EtO. We will be having discussions with our lab early next week to explore what we can do to test nonroad engines.

When you get a chance, would you please send a picture of the Ex. 5 Deliberative Process (DP) emission control label?

Thank you,  
 Angela

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, May 15, 2019 4:38 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Hi Richard,

I just made it back to my phone. I can call you if that would be helpful.

This is an excellent list of some of the top priorities as we see them too. Given the urgency around getting some initial/screening diesel data it might make sense to start there and then meet next week to discuss further testing with Angela and our light-duty center director, Mike Olechiw.

For the testing next week on the diesel can you run both a cold and warm cycle? I am not a testing expert so I've cc'd Angela as this is her area of expertise. If at all possible, this testing is the current highest priority.

We will start the PR for [REDACTED] so that we can get funds supporting this work ASAP. I am confident we can send additional funds in June or July. Since we'll figure that out as we go, it sounds from your note like that kind of incremental funding situation could work, but we can discuss this further.

After we get a chance to orient Bill Charmley, our division director, to the results tomorrow, we will be setting up recurring meetings with him and we will invite you to those recurring meetings so that he can also hear from you directly and we can be discussing next steps in real time together.

I honestly cannot thank you enough not only for making this work your top priority, but the fact that you are generating the highest quality data possible in this emerging issue that has many complexities, is extraordinarily commendable.

Thank you!  
Marion

---

**From:** Shores, Richard  
**Sent:** Wednesday, May 15, 2019 4:01 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Cc:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Subject:** Dyno Testing in RTP

Marion,

After some discussion with Tom, we have come up with a preliminary strategy for the testing that could be possible. Keep in mind that vehicle testing typically costs us \$30k, including the rental and no EtO testing. This last round of EtO testing costs us [REDACTED]. We are considering the following tests/vehicles.

1. [REDACTED] GDI, normal test conditions completed
2. [REDACTED] diesel, maybe start next week without integrated modal HC data
3. Class 8 diesel, should have integrated modal HC data being recorded
4. PFI, gas, considering the idea of two tests, normal and cold test conditions
5. [REDACTED] GDI, cold test conditions
6. TBD vehicle, possible some pre/post catalyst sampling with canisters only?

Notice we are suggesting cold condition testing, what do you think? This data set in completion should go a long way to defining if the mobile source emissions are a significant component of the inventory. Our testing programs are typically buffered with time, allowing us the opportunity to leverage other project resources but more importantly the time we have available for those primarily responsible for the dyno operation. Given our need to collect data at an accelerated schedule translates into additional contractor support and additional costs. Given all the variables here and [REDACTED] understanding that every test we conduct may cause us to change direction, my suggestion is to start the [REDACTED] testing as soon as we can, with or without a continuous HC monitor. Testing the vehicles listed above is assumed to cost more than [REDACTED] but if you have that available, maybe we (ORD) can cover the additional costs. As this sampling occurs, we can keep in touch on the budget, specifically what the testing actually costs. Ultimately, we would like to complete the testing above with the funds available.

Richard Shores  
U.S. Environmental Protection Agency (E343-02)  
Office of Research and Development  
National Risk Management Research Laboratory

Air and Energy Management Division  
Distributed Source & Buildings Branch  
Research Triangle Park, NC27711, USA  
Phone: (919) 541-4983  
email: [shores.richard@epa.gov](mailto:shores.richard@epa.gov)



## Message

**From:** Kariher, Peter [Kariher.Peter@epa.gov]  
**Sent:** 8/15/2019 1:50:10 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]; Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]; George, Ingrid [George.Ingrid@epa.gov]; Hays, Michael [Hays.Michael@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Rosati, Jacky [Rosati.Jacky@epa.gov]; Nessley, Libby [Nessley.Libby@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; McDonald, Joseph [McDonald.Joseph@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Weinstock, Lewis [Weinstock.Lewis@epa.gov]  
**Subject:** RE: EtO emissions testing in NRMRL

I wanted to get some chromatograms to you before today's meeting. These were provided by Enthalpy yesterday and show the separation between acetaldehyde, methanol, butenes, and EtO.

Peter

-----Original Appointment-----

**From:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Sent:** Thursday, August 08, 2019 9:01 AM  
**To:** Hoyer, Marion; Cullen, Angela; Walters, Charles; Fernandez, Antonio; Cook, Rich; Nelson, Brian; Olechiw, Michael; Long, Thomas; Shores, Richard; Kariher, Peter; Yelverton, Tiffany; George, Ingrid; Hays, Michael; Loftis, Kathy; Kolowich, Bruce; Rosati, Jacky; Nessley, Libby; Baldauf, Richard; McDonald, Joseph; Laroo, Chris; Weinstock, Lewis  
**Subject:** EtO emissions testing in NRMRL  
**When:** Thursday, August 15, 2019 12:00 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE

### Ex. 6 Personal Privacy (PP)

Agenda for this meeting (open to additional topics!):

- Report out on the conversation with Enthalpy
- Discuss how the information we learn from Enthalpy informs testing plans for next LDGV (the [redacted] with E10)

Message

---

**From:** Storhok, Ines [storhok.ines@epa.gov]  
**Sent:** 5/30/2019 3:55:11 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; Sargeant, Kathryn [sargeant.kathryn@epa.gov]  
**CC:** Paff, Patricia [paff.patricia@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: Additional funds needed for Ethylene oxide analysis from mobile sources

Yes, that's fine.

I sent message to Haley and waiting for response regarding availability of additional funds. I will let you know what I hear. If there are no additional funds, we might have to find a way to absorb the new work, but I wanted to ask first.

Thanks,  
 Ines

---

**From:** Hoyer, Marion  
**Sent:** Thursday, May 30, 2019 11:52 AM  
**To:** Storhok, Ines <storhok.ines@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>  
**Cc:** Paff, Patricia <paff.patricia@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: Additional funds needed for Ethylene oxide analysis from mobile sources

Can we still use the expiring funds and 'backfill' with 'new/19-20' money from Haley?  
 We found out ORD can take the expiring funds and put it on a contract that they will use to procure the instrument needed.

---

**From:** Storhok, Ines  
**Sent:** Thursday, May 30, 2019 11:37 AM  
**To:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Paff, Patricia <paff.patricia@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: Additional funds needed for Ethylene oxide analysis from mobile sources

I prefer to ask for additional funding for the unexpected/unplanned expenditure, as it is significant.  
 That way we can keep track of the expenses on this line item in a more realistic way.

I will send a message to Haley to check on the availability of additional funds from OTAQ and see what he says.

Thanks,  
 Ines

---

**From:** Sargeant, Kathryn  
**Sent:** Thursday, May 30, 2019 11:14 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Storhok, Ines <storhok.ines@epa.gov>  
**Cc:** Paff, Patricia <paff.patricia@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: Additional funds needed for Ethylene oxide analysis from mobile sources

I think this makes sense programmatically, and Bill has prepped the SLT so they know he may be coming with a resource request. Ines, do you think this is absorbable in our current budget or do we need Bill to be asking Haley et al for more funds?

---

**From:** Hoyer, Marion

**Sent:** Thursday, May 30, 2019 10:46 AM

**To:** Storhok, Ines <storhok.ines@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>

**Cc:** Paff, Patricia <paff.patricia@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>

**Subject:** Additional funds needed for Ethylene oxide analysis from mobile sources

**Importance:** High

Hi, Our OTAQ ASD team (Angela, Mike O, Chris Laroo, Rich Cook, Tony F, and me) met yesterday on ethylene oxide issues, including the need to get more analytical capability on-line for EtO measurements (it is one of the main bottlenecks). We agreed that it would be most expedient short-term and efficient for the long-term if we help ORD bring their EtO analysis method on-line. ORD needs [REDACTED] in order to accomplish this. It could still take them a few months, but we would have priority for sample analysis and it would be free.

If you are ok with this additional expenditure, please let me know.

Our current expenditures on EtO have totaled [REDACTED], so this would bring it to [REDACTED]. The next need for expenditure on this issue would like come after we have more substantive conversations with TATD about bringing on-line the capacity to sample into canisters here, then conducting nonroad engine and LDGV dyno testing here. It will take a few weeks to develop plans and then funding needs for this next phase of testing.

## Message

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** 6/13/2019 4:05:27 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]  
**CC:** Hoyer, Marion [hoyer.marion@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]; Sargeant, Kathryn [sargeant.kathryn@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]  
**Subject:** RE: Dyno Testing in RTP  
**Attachments:** Vehicle ID Form 2013 Ex. 5 Deliberative Process (DP)

For the PFI, we have on hand a 2013 Ex. 5 Deliberative Process (DP) It is a flex fuel vehicle. Do you still want us to use Tier 3 E10 or would you like us to use E85 from the pump? Using this vehicle would save us the cost of leasing a vehicle.

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Cullen, Angela  
**Sent:** Friday, May 17, 2019 3:04 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Richard and Tom,

Thank you for our discussions this week and your work on this project. This email is to circle back with what we discussed yesterday. Our near-term priorities are:

1. Ex. 5 Deliberative Process (DP) GDI, normal test conditions - completed
2. Ex. 5 Deliberative Process (DP) diesel, normal test conditions, with cold-start UDDS and warm UDDS cycles
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The other testing suggestions you sent are still important, but we want to first scope out which mobile source sectors emit EtO. We will be having discussions with our lab early next week to explore what we can do to test nonroad engines.

When you get a chance, would you please send a picture of the Ex. 5 Deliberative Process (DP) emission control label?

Thank you,  
 Angela

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, May 15, 2019 4:38 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>

**Cc:** Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>

**Subject:** RE: Dyno Testing in RTP

Hi Richard,

I just made it back to my phone. I can call you if that would be helpful.

This is an excellent list of some of the top priorities as we see them too. Given the urgency around getting some initial/screening diesel data it might make sense to start there and then meet next week to discuss further testing with Angela and our light-duty center director, Mike Olechiw.

For the testing next week on the diesel can you run both a cold and warm cycle? I am not a testing expert so I've cc'd Angela as this is her area of expertise. If at all possible, this testing is the current highest priority.

We will start the PR for [REDACTED] so that we can get funds supporting this work ASAP. I am confident we can send additional funds in June or July. Since we'll figure that out as we go, it sounds from your note like that kind of incremental funding situation could work, but we can discuss this further.

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Thank you!

Marion

---

**From:** Shores, Richard

**Sent:** Wednesday, May 15, 2019 4:01 PM

**To:** Hoyer, Marion <hoyer.marion@epa.gov>

**Cc:** Long, Thomas <Long.Thomas@epa.gov>

**Subject:** Dyno Testing in RTP

Marion,

After some discussion with Tom, we have come up with a preliminary strategy for the testing that could be possible. Keep in mind that vehicle testing typically costs us \$30k, including the rental and no EtO testing. This last round of EtO testing costs us [REDACTED] Ex. 4 CB. We are considering the following tests/vehicles.

1. [REDACTED] GDI, normal test conditions completed
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3. [REDACTED] Class 8 diesel, should have integrated modal HC data being recorded
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5. [REDACTED] GDI, cold test conditions
6. [REDACTED] TBD vehicle, possible some pre/post catalyst sampling with canisters only?

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can keep in touch on the budget, specifically what the testing actually costs. Ultimately, we would like to complete the testing above with the funds available.

Richard Shores  
U.S. Environmental Protection Agency (E343-02)  
Office of Research and Development  
National Risk Management Research Laboratory  
Air and Energy Management Division  
Distributed Source & Buildings Branch  
Research Triangle Park, NC27711, USA  
Phone: (919) 541-4983  
email: [shores.richard@epa.gov](mailto:shores.richard@epa.gov)

## Message

**From:** Walters, Charles [walters.charles@epa.gov]  
**Sent:** 7/25/2019 2:53:33 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]  
**Subject:** Ex. 4 CBI data review  
**Attachments:** Copy of Ex. 4 CBI Summary for OTAQ (20190718)ctwPratioCO2.xlsx

All,

I reviewed the dyno data and Enthalpy report for the [REDACTED]. Since there are concerns with the EtO analysis; I only focused on canister sample collection and CO2 agreement. Here are my observations.

- The uncorrected bag CO2 vs canister CO2 agreed within 3% (see yellow areas in spreadsheet). This is significantly better than the [REDACTED] testing. I noticed that the vacuum decay in the canister was considerably smaller than the testing done on the [REDACTED]. The [REDACTED] final Pratios averaged 0.549; which is very near the 0.528 theoretical choked flow Pratio limit for an orifice. This would result in a more constant sample flow over the test phase providing a more representative sample over the phase. This could explain the better CO2 agreement in the [REDACTED] vs the [REDACTED] testing.
- Enthalpy presented the canister pressurization data differently for the [REDACTED] Ex. 5 Deliberative Process (DP). It would be helpful if the data presentation was consistent. Specifically, the [REDACTED] Ex. 4 CBI report provided controller flow data for "initial flow" and "return flow" whereas the [REDACTED] report did not. I assume the "return flow" is the flowrate recorded at the end of sample canister vacuum using an inert gas. This data is very helpful in determining final flow rate as a function of vacuum decay over the sample phase. The [REDACTED] flow data shows initial vs return flow to be very similar (as expected due to the ending Pratio very near the theoretical limit of 0.528 as discussed above). It would be nice to have this data for the [REDACTED] and any future testing.

#### Proposed questions to Enthalpy and/or ORD

Below are proposed questions to Enthalpy. These questions are designed to get a better understanding of the before and after state of the sample flow and perhaps influence the controller flow selected for the sample period. I know that this method is still considered qualitative; however, if it transitions to quantitative we will need a better handle on the sample flow and proportionality. I'm not sure if now is the right time to be asking these questions nor do I have a read on cost impacts in asking these questions. We should discuss.

- Is "initial flow" vs "return flow" available for the [REDACTED] Ex. 4 CBI (similar to the data presented on page 89 of the [REDACTED] report)?
- Can the "initial flow" vs "return flow" data be included in the report for any future testing?
- Is "return flow" measured at the "as received" canister vacuum?
- What nominal flow rate is selected for each sample period? 505s, 1372s, 1060s
- What nominal flow rate options are available?

Thanks,  
 Chuck

## Message

**From:** Fernandez, Antonio [fernandez.antonio@epa.gov]  
**Sent:** 6/13/2019 12:58:03 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]  
**CC:** Nelson, Brian [nelson.brian@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: HD gasoline truck testing for EtO

Thanks Marion. I will look into the mechanism and cost of the leasing we did last year for the CTI program. We leased one **Ex. 5 Deliberative Process (DP)**

Tony

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, June 12, 2019 9:43 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Nelson, Brian <nelson.brian@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>  
**Subject:** RE: HD gasoline truck testing for EtO

Hi Tom,

I'm looping Tony Fernandez into this conversation on the HD gasoline truck to test and acquisition of the truck. Tony thinks we can look into leasing, so he'll be in touch.

Thanks again!  
 Marion

---

**From:** Hoyer, Marion  
**Sent:** Monday, June 10, 2019 10:21 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Nelson, Brian <nelson.brian@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: HD gasoline truck testing for EtO

Hi Tom,

This is great news. Brian Nelson is our center director for Heavy-Duty On-Road and Non-Road and he let me know that a Class 5 **Ex. 5 Deliberative Process (DP)** is what we're looking for.

What procurement approach do you use for leasing? Is it possible to sub that or would we need a new contract?

Marion

---

**From:** Long, Thomas  
**Sent:** Monday, June 10, 2019 10:06 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Nelson, Brian <nelson.brian@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: HD gasoline truck testing for EtO



Yes, we can test HD spark ignition as well as diesel on the heavy-duty chassis dynamometer.

If you wanted to do it that way, you could lease a truck in the Raleigh area for our testing purposes. What class of vehicle are we thinking about?

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Hoyer, Marion  
**Sent:** Monday, June 10, 2019 9:15 AM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Cc:** Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)>; Olechiw, Michael <[olechiw.michael@epa.gov](mailto:olechiw.michael@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>  
**Subject:** HD gasoline truck testing for EtO

Hi Tom and Richard,

Quick question for you – can you all test a HD gasoline truck on your HD dyno? We are talking about the need to prioritize this testing because if we have EtO in the exhaust from these trucks, we might have opportunities to get reductions more quickly than from LD.

Let us know if this is something you can test and if so, what we can do to help with procurement of a truck you could hopefully test after the Class 8 diesel.

Thanks,  
Marion

## Message

**From:** Walters, Charles [walters.charles@epa.gov]  
**Sent:** 6/11/2019 11:39:42 AM  
**To:** Nelson, Brian [nelson.brian@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; Bryson, James [bryson.james@epa.gov]; McDonald, Joseph [McDonald.Joseph@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]  
**Subject:** RE: nonroad SI -- EtO: quick report-out on trip to NRMRL (sampling into summa canisters and discussions with Ingrid on analysis)

All,

For nonroad SI, we have several EPA-owned engines available. Class I and Class II nonhandheld, phase 3 Hondas. Also available are nonhandheld Phase 2 Ex. 5 Deliberative Process (DP) and a Phase 3, 2-stroke handheld.

All of these engines are carbureted and uncatalyzed. The test site is configured for continuous dilute sampling.

Thanks,  
Chuck

---

**From:** Nelson, Brian  
**Sent:** Monday, June 10, 2019 1:13 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; Bryson, James <bryson.james@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>  
**Subject:** RE: Ex. 6 Personal Privacy (PP) -- EtO: quick report-out on trip to NRMRL (sampling into summa canisters and discussions with Ingrid on analysis)

It looks like a '13-to-'17 Ex. 6 Personal Privacy (PP) could be a good PFI candidate:

## Ex. 5 Deliberative Process (DP)

-----Original Appointment-----

**From:** Hoyer, Marion

**Sent:** Sunday, June 9, 2019 5:25 PM

**To:** Hoyer, Marion; Laroo, Chris; Geidosch, Justine; Cullen, Angela; Cook, Rich; Fernandez, Antonio; Olechiw, Michael; Nelson, Brian; Walters, Charles; Baldauf, Richard; Bryson, James; McDonald, Joseph; Loftis, Kathy

**Subject:** EtO: quick report-out on trip to NRMRL (sampling into summa canisters and discussions with Ingrid on analysis)

**When:** Monday, June 10, 2019 12:00 PM-12:30 PM (UTC-05:00) Eastern Time (US & Canada).

**Where:** AA-Room-Office-S109-ConfRoom/AA-OTAQ-OFFICE

I apologize not everyone can make this time.

Kat – we will get to catch up with you later in the week; Angela has scheduled a time to talk about analysis of EtO.

## Message

**From:** Christopher Laroo [chris\_laroo@yahoo.com]  
**Sent:** 6/6/2019 11:31:31 AM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]  
**Subject:** Notes from Trip to RTP on EtO Testing  
**Attachments:** image2.jpeg; image3.jpeg; image4.jpeg

**Flag:** Follow up

Marion and Angela,

I have been having issues connecting my personal computer to the VPN since the latest securing update, so I am sending this from my personal address and I thought you might was a readout from yesterday's trip to RTP prior to my returning to the office on Monday.

The sampling setup is relatively easy to incorporate into the any of our test sites. They use a 6 L passivated, precleaned canister supplied by Enthalpy. Enthalpy also supplies a flow controller that consists of a passivated sample pathway that included a vacuum gauge and a venturi to ensure constant sample flow into the canister. The controller sample pathway is about 8 inches in total length. The controller flow is customized (within the range of available off the shelf venturi flow rates) for the duration of the test interval the sample is being drawn from. The flow rate is designed to maximize sample flow while ensuring that the vacuum is not totally drawn down over the test. For example the flow controller flow rate for Ph1 of the vehicle FTP is different than the one for a combined Ph2 and Ph3 (505s for Ph1 vs 1362 for Ph2/3). Initially they had Enthalpy supply a single control for each flow setting for a given suite of tests, meaning that they would reuse, for example, the Ph1 controller for all Ph1 testing on the [REDACTED]. They have modified the contract with Enthalpy so that for future testing the controllers are single use, thus they will supply one per test. Their concern is contamination, but realistically I doubt there is an influence from reuse based on the test results we have seen from the [REDACTED] 0.

We observed the test on the [REDACTED]. Angela, I did not get a picture of the emission label as the hood was down for testing and the test site was very busy. Tom said to follow-up with him and he will get you one. They don't attached the canister sample line to the controller or the controller to the canister until just prior to the start of the test. Everything is capped. About 10 minutes prior, they attach the controller to the canister and leave the upstream end capped. They then manually open the valve to perform a combined vacuum and leak check. The vacuum value is recorded. About 5 minutes prior the start of the test, they attached the upstream end of the controller to the sample line/probe. The sample/line probe is designed to be as short at possible. I would estimate that it is 18" long. It is 1/4 316 SS passivated with Restek's silcosteel passivation technology. The material is off the shelf supplied by Restek. Any Swagloc connectors are also passivated and supplied by Restek, but those are all a part of the controller supplied by Enthalpy. Their probe enters perpendicular to the flow in the tunnel and makes a 90 degree bend to face upstream. The probe is never removed. It protrudes 4" into the sample stream from the wall on an 18" diameter tunnel.

The driver honks the horn at the start of the test and the technician manually opens the valve on the canister to begin sampling. I don't think there is a way to automate it. The same occurs at the end of

the test interval and the valve is closed. I can write up a detailed procedure to follow when I am in the office next week.

Based on what I observed, I believe that NRMRL is executing sound tests. I saw nothing of major concern.

We spent time talking to Ingrid on her method development and she is a long way off and really needs new equipment to get lower DLs. I suspect from now into the future, any analysis will need to be contracted out the Enthalpy.

I spent a lot of time talking to Kat as we had time to kill in the airport after the meeting. She is a very skilled chromatographer with a LOT of experience. I think it would be beneficial to send her the 400+ page report from Enthalpy on the [REDACTED] along with the results summarized in the Excel file as I believe she will be able to determine if there is any potential for coelution of other analytes with EtO in Enthalpy's analytical method. I also believe that given the right resources (equipment) she could establish a method in our lab.

Let me know if you have any other questions for now. Photos are attached.

Chris

## Message

**From:** Fernandez, Antonio [fernandez.antonio@epa.gov]  
**Sent:** 6/12/2019 5:02:19 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; Mitchell, George [Mitchell.George@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]  
**CC:** Olechiw, Michael [olechiw.michael@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: HD gasoline truck testing for EtO

That's what staff is here for – providing our input.

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, June 12, 2019 12:30 PM  
**To:** Mitchell, George <Mitchell.George@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Cc:** Olechiw, Michael <olechiw.michael@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: HD gasoline truck testing for EtO

Thank you all! Brian Nelson was in my office when this came in and I wrote to Tom with Brian's direction on this (I cc'd Mike, Brian and Angela so it sounds like you didn't get the forward on that – sorry!).

Brian said the same thing you and George noted. When Tom replies, I'll fold you in to the response on that, thanks for noting it for me.

---

**From:** Mitchell, George  
**Sent:** Wednesday, June 12, 2019 10:18 AM  
**To:** Fernandez, Antonio <fernandez.antonio@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Cc:** Olechiw, Michael <olechiw.michael@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: HD gasoline truck testing for EtO

You will probably have the best luck acquiring an Ex. 4 CBI with the Ex. 5 Deliberative Process (DP) gasoline engine.

George Mitchell

US Environmental Protection Agency  
Office of Transportation and Air Quality  
Heavy-Duty Onroad and Nonroad Center  
2000 Traverwood Drive  
Ann Arbor, MI 48105  
Phone: 734.214.4491

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**From:** Fernandez, Antonio  
**Sent:** Wednesday, June 12, 2019 10:11 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Mitchell, George <Mitchell.George@epa.gov>  
**Cc:** Olechiw, Michael <olechiw.michael@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: HD gasoline truck testing for EtO

Hi Marion.

I don't know if anyone has responded to Tom Long yet but the HD gasoline truck that Brian and others are thinking that may be of interest are those in the class 4 and higher that have catalyst with locations very distant from the

engine. These are mainly the trucks that are outfitted with a enclosed box or flatbed. A HD complete or incomplete pick-up (class 3) is less impacted by this design "limitation" and of less interest. Anything gasoline will work or a gasoline Ram also has some large(class 5) versions but they are rarer in gasoline trim.

We could probably see how we leased our two trucks for the testing we performed last year.

George, would you recommend the Isuzu gasoline(GM engine) or the

Tony

---

**From:** Olechiw, Michael  
**Sent:** Monday, June 10, 2019 10:19 AM  
**To:** Fernandez, Antonio <[fernandez.antonio@epa.gov](mailto:fernandez.antonio@epa.gov)>  
**Subject:** FW: HD gasoline truck testing for EtO

---

**From:** Long, Thomas  
**Sent:** Monday, June 10, 2019 10:06 AM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Cc:** Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)>; Olechiw, Michael <[olechiw.michael@epa.gov](mailto:olechiw.michael@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>  
**Subject:** RE: HD gasoline truck testing for EtO

Yes, we can test HD spark ignition as well as diesel on the heavy-duty chassis dynamometer.

If you wanted to do it that way, you could lease a truck in the Raleigh area for our testing purposes. What class of vehicle are we thinking about?

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

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**From:** Hoyer, Marion  
**Sent:** Monday, June 10, 2019 9:15 AM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Cc:** Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)>; Olechiw, Michael <[olechiw.michael@epa.gov](mailto:olechiw.michael@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>  
**Subject:** HD gasoline truck testing for EtO

Hi Tom and Richard,

Quick question for you – can you all test a HD gasoline truck on your HD dyno? We are talking about the need to prioritize this testing because if we have EtO in the exhaust from these trucks, we might have opportunities to get reductions more quickly than from LD.

Let us know if this is something you can test and if so, what we can do to help with procurement of a truck you could hopefully test after the Class 8 diesel.

Thanks,  
Marion



## Message

**From:** Cullen, Angela [cullen.angela@epa.gov]  
**Sent:** 6/10/2019 1:10:23 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]  
**Subject:** RE: draft email to Bill and David

This looks good. I made edits to the second bullet.

I can own the testing updates.

---

**From:** Hoyer, Marion  
**Sent:** Sunday, June 09, 2019 5:20 PM  
**To:** Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** draft email to Bill and David

Hi,

To fulfill the request from Bill for periodic updates on the EtO work, I've drafted a short note below. Does this capture what you'd want to make sure he knows too? Do you want to own these updates when they focus mainly on emissions testing? I've made sure Bill knows that I am functioning as a cross-office coordinator of sorts, but clearly emissions testing/planning or analysis & QA of these raw data are not my or my centers areas of expertise. And I'm in way over my head alone rolling out these lead reports and I am afraid I'm going to let something important on EtO drop. We can talk.

Bill and David,

We are on your calendars for June 27 to give you an update on ethylene oxide and discuss ongoing work and plans. Since we had to postpone this week's in-person update, we've briefly summarized highlights below.

- This past week NRMRL tested a [REDACTED] diesel truck ("Phase 2" test noted in the list below). We should have results in ~3 weeks. NRMRL is moving down this list of vehicles to test in sequential order.
- Three people from OTAQ (Chris Laroo, Kat Loftis, and Jim Bryson ) visited the NRMRL facility last Wednesday to learn about their sampling methods so that we can be able to set up sampling into a summa canister here at NVFEL. We are meeting weekly to talk about next steps with regard to sampling here and priorities for the testing we'll be conducting.
- Ines is working with Mike Haley to see if the IO can fund a [REDACTED] purchase of analytical equipment so that ORD can bring an analytical method on-line this summer/fall that is equivalent to the method used by the contractor we are currently using. This will provide the analysis capability we will need as we start to generate samples at NVFEL and continue to test in NRMRL. We are also talking with Bruce and Kat about the analytical methods they are evaluating.

Let us know if you have questions.

**Phase 1 (Complete)**

Source: Light-duty SI vehicle ( [REDACTED] Ex. 5 Deliberative Process (DP) )

**Phase 2 (June 3)**

Vehicle: 2011 [REDACTED] Ex. 6 Personal Privacy (PP) ], Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)  
 Fuel: Ultra-low sulfur diesel fuel.

**Phase 3 (June 17)**

Vehicle: A common naturally aspirated PFI light-duty vehicle  
 Fuel: Tier 3 E10 cert fuel

**Phase 4 (June 24 or July 8)**

Vehicle: [Ex. 6 Personal Privacy (PP)] Turbocharged GDI 2.7L (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

**Phase 5 (tbd)**

Vehicle: Class 8 HDDT

## Message

**From:** Fernandez, Antonio [fernandez.antonio@epa.gov]  
**Sent:** 7/26/2019 12:40:01 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]  
**CC:** Cook, Rich [Cook.Rich@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]  
**Subject:** RE: [Ex. 4 CBI] data review and update on ORD testing

Hi Marion. Did Tom give you any specifics on the HD gasoline truck that they have lined up? Just wondering which one they ended up finding.

Tony

---

**From:** Hoyer, Marion  
**Sent:** Friday, July 26, 2019 8:12 AM  
**To:** Fernandez, Antonio <fernandez.antonio@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Subject:** RE: [Ex. 4 CBI] data review and update on ORD testing

Thank you Chuck for looking at the Enthalpy report closely.

We are talking with OAQPS and ORD next week (Wed am) to discuss Enthalpy's work, especially as it relates to the F750. OAQPS and ORD (mainly Doris Xi, Tiffany Yelverton and Peter Kariher) have been working with Enthalpy on methods for about a year so we are going to see if they can answer the questions we have before we ask for a meeting with Enthalpy. There are GCMS questions Kat has for them that we will start with, and since you have questions too, I added you to the meeting (it looks like you are available, but let me know if not).

Also – FYI for everyone

■ Tom Long left me a message yesterday letting us know that two compressors went down in their lab so they had to scrap the [Ex. 4 CBI] testing (with zero ethanol in fuel); they'll resume that testing the week of Aug 5. Tom is on vacation starting today through Aug 2.

■ ORD has a HD gas truck lined up, so they are planning to test this truck after completing the [Ex. 4 CBI]

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**From:** Fernandez, Antonio  
**Sent:** Thursday, July 25, 2019 12:27 PM  
**To:** Walters, Charles <walters.charles@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>  
**Subject:** RE: [Ex. 4 CBI] data review

Thank you Chuck. I assume that since Chris is working directly with ORD on measurement/methodologies, these questions can be directed to them through that channel?

Tony

**From:** Walters, Charles

**Sent:** Thursday, July 25, 2019 10:54 AM

**To:** Cullen, Angela <cullen.angela@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>

**Subject:** Ex. 4 CBI data review

All,

I reviewed the dyno data and Enthalpy report for the [REDACTED]. Since there are concerns with the EtO analysis; I only focused on canister sample collection and CO2 agreement. Here are my observations.

- The uncorrected bag CO2 vs canister CO2 agreed within 3% (see yellow areas in spreadsheet). This is significantly better than the [REDACTED] testing. I noticed that the vacuum decay in the canister was considerably smaller than the testing done on the [REDACTED]. The [REDACTED] final Pratie's averaged 0.549; which is very near the 0.528 theoretical choked flow Pratie limit for an orifice. This would result in a more constant sample flow over the test phase providing a more representative sample over the phase. This could explain the better CO2 agreement in the [REDACTED] Ex. 5 Deliberative Process (DP) testing.
- Enthalpy presented the canister pressurization data differently for the [REDACTED] Ex. 5 Deliberative Process (DP). It would be helpful if the data presentation was consistent. Specifically, the [REDACTED] report provided controller flow data for "initial flow" and "return flow" whereas the [REDACTED] report did not. I assume the "return flow" is the flowrate recorded at the end of sample canister vacuum using an inert gas. This data is very helpful in determining final flow rate as a function of vacuum decay over the sample phase. The [REDACTED] flow data shows initial vs return flow to be very similar (as expected due to the ending Pratie very near the theoretical limit of 0.528 as discussed above). It would be nice to have this data for the [REDACTED] and any future testing.

#### Proposed questions to Enthalpy and/or ORD

Below are proposed questions to Enthalpy. These questions are designed to get a better understanding of the before and after state of the sample flow and perhaps influence the controller flow selected for the sample period. I know that this method is still considered qualitative; however, if it transitions to quantitative we will need a better handle on the sample flow and proportionality. I'm not sure if now is the right time to be asking these questions nor do I have a read on cost impacts in asking these questions. We should discuss.

- Is "initial flow" vs "return flow" available for the [REDACTED] (similar to the data presented on page 89 of the [REDACTED] report)?
- Can the "initial flow" vs "return flow" data be included in the report for any future testing?
- Is "return flow" measured at the "as received" canister vacuum?
- What nominal flow rate is selected for each sample period? 505s, 1372s, 1060s
- What nominal flow rate options are available?

Thanks,  
Chuck

## Message

**From:** Cook, Rich [Cook.Rich@epa.gov]  
**Sent:** 7/15/2019 12:56:20 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; Sargeant, Kathryn [sargeant.kathryn@epa.gov]  
**Subject:** RE: DELIBERATIVE -- Ethylene Oxide and Mobile Sources backgrounder for Sarah July 2019 - Clean with comments.docx

## Ex. 5 Deliberative Process (DP)

Rich Cook  
Health Effects, Benefits, and Air Toxics Center  
Assessment and Standards Division  
Office of Transportation and Air Quality  
U. S. Environmental Protection Agency  
(734)214-4827

---

**From:** Hoyer, Marion  
**Sent:** Sunday, July 14, 2019 2:43 PM  
**To:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>  
**Subject:** FW: DELIBERATIVE -- Ethylene Oxide and Mobile Sources backgrounder for Sarah July 2019 - Clean with comments.docx

FYI I followed up with Lew and Alison below on status of OAQPS thinking wrt source testing. We can discuss this further. I think it would be best as a next step with OAQPS to have a conversation with Mike, Alison and Lew with the three of us before we brief Sarah.

I'll also ask Lew this week if/when they will be (or already have) briefing Anne.

---

**From:** Hoyer, Marion  
**Sent:** Sunday, July 14, 2019 1:14 PM  
**To:** Davis, Alison <Davis.Alison@epa.gov>  
**Cc:** Weinstock, Lewis <Weinstock.Lewis@epa.gov>  
**Subject:** RE: DELIBERATIVE -- Ethylene Oxide and Mobile Sources backgrounder for Sarah July 2019 - Clean with comments.docx

Thank you both SO MUCH, this is really helpful. I've attached the version I'm floating around with our center directors for review before getting it to our DDs then Sarah. I kept everything (except the challenges to the IRIS value; I can explain. We'll tell Sarah that verbally or maybe in one bullet in our August briefing for her – which we'll send to you for review) and did some rearranging.

We had been using the concentration of the one in a thousand risk because it was right at the background monitored levels so easier to communicate, but I understand the importance of aligning with our consistent use of X in a million, so I changed it to that.

When we talked in early July, you thought you would probably be bringing up the topic of source testing to Mike and Peter so we can all get aligned on an OAR approach and perspective about what can be accomplished with current methods (are we collectively trying to get a “yes/no” its there or not for combustion sources generally?). Have you been able to touch base on this? This is something we'll want to raise to Sarah when we brief her in August – the OAR thinking on combustion source testing and the strategy/approach. What I think I understand from the most recent talk

with Tiffany, Peter, and others (July 8) is that the TO15 method we are using for mobile is qualitative and we won't consider results robust and ready for public communication until we have conducted robust cross-method and cross-lab comparisons. Tiffany indicated that other combustion sources will be tested before the end of the year, but for the purpose of method evaluation, not source characterization. Does that align with your understanding Lew?

Thanks again,  
Marion

---

**From:** Davis, Alison  
**Sent:** Thursday, July 11, 2019 4:46 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Cc:** Weinstock, Lewis <[Weinstock.Lewis@epa.gov](mailto:Weinstock.Lewis@epa.gov)>  
**Subject:** DELIBERATIVE -- Ethylene Oxide and Mobile Sources backgrounder for Sarah July 2019 - Clean with comments.docx

Marion,  
We added material to the backgrounder that you, Lew and I discussed last week. Attached is a clean version – with comments left in, and the RLSO for reference, in case you need it.  
-Alison

---

Alison Davis  
Senior Advisor for Public Affairs  
US EPA, Office of Air Quality Planning & Standards  
Research Triangle Park, NC 27711  
Desk: 919-541-7587  
Mobile: 919-624-0872

## Appointment

**From:** Hoyer, Marion [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DCDB076983049369A80F430A9F1D067-HOYER, MARION]  
**Sent:** 8/8/2019 1:01:20 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Michael Olechiw (olechiw.michael@epa.gov) [olechiw.michael@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]; Kariher, Peter [Kariher.Peter@epa.gov]; Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]; George, Ingrid [George.Ingrid@epa.gov]; Hays, Michael [Hays.Michael@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Rosati, Jacky [Rosati.Jacky@epa.gov]; Nessley, Libby [nessley.libby@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; McDonald, Joseph [mcdonald.joseph@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]  
**BCC:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE [AA-Room-Office-C147-ConfRoom@epa.gov]  
**Subject:** EtO emissions testing in NRMRL  
**Location:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE  
**Start:** 8/14/2019 2:00:00 PM  
**End:** 8/14/2019 3:00:00 PM  
**Show Time As:** Busy

**Required Attendees:** Cullen, Angela; Walters, Charles; Fernandez, Antonio; Cook, Rich; Nelson, Brian; Michael Olechiw (olechiw.michael@epa.gov); Long, Thomas; Shores, Richard; Kariher, Peter; Yelverton, Tiffany; George, Ingrid; Hays, Michael; Loftis, Kathy; Kolowich, Bruce; Rosati, Jacky; Nessley, Libby; Baldauf, Richard; McDonald, Joseph; Laroo, Chris

**Ex. 6 Personal Privacy (PP)**

Agenda for this meeting (open to additional topics!):

- **Ex. 4 CBI** results and any new questions this raises Tom Long
- Topics anticipated for the conversation with Enthalpy this afternoon (or is it tomorrow?) Peter et al.,
- Discuss testing plans for next LDGV (the **Ex. 4 CBI** with E10) and timing (all)

## Message

**From:** Walters, Charles [walters.charles@epa.gov]  
**Sent:** 8/1/2019 7:47:57 PM  
**To:** Laroo, Chris [laroo.chris@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]  
**Subject:** RE: Update o questions for Ethalpy and a question for OTAQ

I agree.

---

**From:** Laroo, Chris <laroo.chris@epa.gov>  
**Sent:** Thursday, August 01, 2019 3:09 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>  
**Subject:** RE: Update o questions for Ethalpy and a question for OTAQ

Marion,

I am okay with that course of action.

Regards,

Chris Laroo  
 Environmental Protection Specialist  
 US Environmental Protection Agency  
 Office of Transportation and Air Quality  
 Assessment and Standards Division  
 2000 Traverwood Dr.  
 Ann Arbor, MI 48105  
 (734) 214-4937  
 (734) 214-4055 (fax)  
 Email: laroo.chris@epa.gov

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**Sent:** Thursday, August 01, 2019 12:19 PM  
**To:** Walters, Charles <walters.charles@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>  
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FYI below. ORD wants to go visit Enthalpy personally and get all our questions answered so for now, let's sit tight.

Tom Long is back next week and I think it makes sense to focus on our (EPA) questions first then design the next testing setup for the ☐ on E10. Do you all agree? If so, I'll call Richard Shores and propose / ask if he can focus his team on collecting info for a week to develop the next test plan.



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**From:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Sent:** Thursday, August 01, 2019 10:36 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Rosati, Jacky <Rosati.Jacky@epa.gov>  
**Subject:** RE: Additional questions for Ethalpy

Marion,

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Thanks,

Peter

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**From:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Sent:** Thursday, August 01, 2019 10:10 AM  
**To:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Subject:** RE: Additional questions for Ethalpy

Hey Peter, when you put the agenda together for the meeting with Enthalpy, you could list the agenda item for Chucks questions below under "Canister Pressurization data, Sample Flowrate, and Proportionality"

Cheers,  
Marion

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**Sent:** Thursday, August 01, 2019 7:36 AM  
**To:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Cc:** Walters, Charles <walters.charles@epa.gov>  
**Subject:** Additional questions for Ethalpy

Hi Peter,

Chuck's questions are below, highlighted in yellow.

Thanks so much for setting up the meeting with Enthalpy!

Marion

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**From:** Long, Thomas <Long.Thomas@epa.gov>  
**Sent:** Friday, July 26, 2019 1:10 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Walters, Charles <walters.charles@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: F750 data review

Most of those questions will need to be posed to Enthalpy, but the can flow controllers were:

505 seconds ~ 670 ml/min  
 1372 seconds ~ 180 ml/min  
 1060 seconds ~ 180 ml/min

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Hoyer, Marion  
**Sent:** Friday, July 26, 2019 11:58 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Walters, Charles <walters.charles@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** FW: F750 data review

Hi Tom,

Here are the questions Chuck has. Thanks for letting us know your thoughts.  
 Marion

---

**From:** Walters, Charles  
**Sent:** Thursday, July 25, 2019 10:54 AM  
**To:** Cullen, Angela <cullen.angela@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>  
**Subject:** F750 data review

All,

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**Proposed questions to Enthalpy and/or ORD**

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- Is "initial flow" vs "return flow" available for the [ ] similar to the data presented on page 89 of the [ ] report)?
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- Is "return flow" measured at the "as received" canister vacuum?
- What nominal flow rate is selected for each sample period? 505s, 1372s, 1060s
- What nominal flow rate options are available?

Thanks,  
Chuck

## Message

**From:** Loftis, Kathy [loftis.kathy@epa.gov]  
**Sent:** 8/1/2019 7:47:21 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]  
**Subject:** RE: Update o questions for Ethalpy and a question for OTAQ

I agree that would be fruitful to use feedback from Peter's Enthalpy site-visit to inform the next testing phase. I'm assuming that with more information, we will want to make adjustments one way or another.

Thanks,  
 Kat

---

**From:** Cullen, Angela <cullen.angela@epa.gov>  
**Sent:** Thursday, August 1, 2019 3:40 PM  
**To:** Fernandez, Antonio <fernandez.antonio@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>  
**Subject:** RE: Update o questions for Ethalpy and a question for OTAQ

## Ex. 5 Deliberative Process (DP)

Angela

---

**From:** Fernandez, Antonio <fernandez.antonio@epa.gov>  
**Sent:** Thursday, August 01, 2019 3:24 PM  
**To:** Laroo, Chris <laroo.chris@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>  
**Subject:** RE: Update o questions for Ethalpy and a question for OTAQ

"next testing setup for the [REDACTED] on E10"

Isn't the next testing on the [REDACTED] on E0? E10 was the first fuel it ran, correct?

---

**From:** Laroo, Chris <laroo.chris@epa.gov>  
**Sent:** Thursday, August 01, 2019 3:09 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>  
**Subject:** RE: Update o questions for Ethalpy and a question for OTAQ

Marion,

I am okay with that course of action.

Regards,

Chris Laroo  
Environmental Protection Specialist  
US Environmental Protection Agency  
Office of Transportation and Air Quality  
Assessment and Standards Division  
2000 Traverwood Dr.  
Ann Arbor, MI 48105  
(734) 214-4937  
(734) 214-4055 (fax)  
Email: laroo.chris@epa.gov

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**To:** Walters, Charles <walters.charles@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>  
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FYI below. ORD wants to go visit Enthalpy personally and get all our questions answered so for now, let's sit tight.

Tom Long is back next week and I think it makes sense to focus on our (EPA) questions first then design the next testing setup for the  on E10. Do you all agree? If so, I'll call Richard Shores and propose / ask if he can focus his team on collecting info for a week to develop the next test plan.

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**From:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Sent:** Thursday, August 01, 2019 10:36 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Rosati, Jacky <Rosati.Jacky@epa.gov>  
**Subject:** RE: Additional questions for Ethalpy

Marion,

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Thanks,

Peter

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**From:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Sent:** Thursday, August 01, 2019 10:10 AM

**To:** Kariher, Peter <[Kariher.Peter@epa.gov](mailto:Kariher.Peter@epa.gov)>  
**Subject:** RE: Additional questions for Ethalpy

Hey Peter, when you put the agenda together for the meeting with Enthalpy, you could list the agenda item for Chucks questions below under "Canister Pressurization data, Sample Flowrate, and Proportionality"

Cheers,  
Marion

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**From:** Hoyer, Marion  
**Sent:** Thursday, August 01, 2019 7:36 AM  
**To:** Kariher, Peter <[Kariher.Peter@epa.gov](mailto:Kariher.Peter@epa.gov)>  
**Cc:** Walters, Charles <[walters.charles@epa.gov](mailto:walters.charles@epa.gov)>  
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Hi Peter,

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**Sent:** Friday, July 26, 2019 1:10 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
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**Subject:** RE: F750 data review

Most of those questions will need to be posed to Enthalpy, but the can flow controllers were:

505 seconds ~ 670 ml/min  
1372 seconds ~ 180 ml/min  
1060 seconds ~ 180 ml/min

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

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**From:** Hoyer, Marion  
**Sent:** Friday, July 26, 2019 11:58 AM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Walters, Charles <[walters.charles@epa.gov](mailto:walters.charles@epa.gov)>; Fernandez, Antonio <[fernandez.antonio@epa.gov](mailto:fernandez.antonio@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>  
**Subject:** FW: [REDACTED] data review

Hi Tom,

Here are the questions Chuck has. Thanks for letting us know your thoughts.

Marion

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**From:** Walters, Charles

**Sent:** Thursday, July 25, 2019 10:54 AM

**To:** Cullen, Angela <cullen.angela@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>

**Subject:** [REDACTED] ta review

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Thanks,  
Chuck

## Message

**From:** Nelson, Brian [nelson.brian@epa.gov]  
**Sent:** 8/1/2019 5:30:22 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]  
**Subject:** RE: Update o questions for Ethalpy and a question for OTAQ

I agree with the approach you suggest—talk to Tom Long first.

---

**From:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Sent:** Thursday, August 1, 2019 12:19 PM  
**To:** Walters, Charles <walters.charles@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>  
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**Subject:** RE: Ex. 4 CBI data review

Most of those questions will need to be posed to Enthalpy, but the can flow controllers were:

505 seconds ~ 670 ml/min  
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1060 seconds ~ 180 ml/min

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

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**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
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Marion

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**From:** Walters, Charles  
**Sent:** Thursday, July 25, 2019 10:54 AM  
**To:** Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Laroo, Chris

<laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>

**Subject:** F750 data review

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Message

---

**From:** Weinstock, Lewis [Weinstock.Lewis@epa.gov]  
**Sent:** 6/3/2019 11:25:44 AM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]  
**Subject:** RE: mobile source testing and in-house analysis for EtO


Great news – thanks for the update.

Lewis Weinstock | Office of Air Quality Planning & Standards | U.S. Environmental Protection Agency | Research Triangle Park, NC 27711 | Phone: 919-541-3661|

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**From:** Hoyer, Marion  
**Sent:** Saturday, June 01, 2019 4:19 PM  
**To:** Weinstock, Lewis <Weinstock.Lewis@epa.gov>; Yelverton, Tiffany <Yelverton.Tiffany@epa.gov>  
**Subject:** mobile source testing and in-house analysis for EtO

I just wanted you to know that we are getting funds to Mike Hays for procurement of a new GC-MS so that Ingrid can get the EtO analysis method running with low detection limits. We are doing this so that the bottleneck Enthalpy can create doesn't become an issue as we ramp up mobile source testing both in NRMRL and here in our lab. I'm sure the instrument will be useful for other samples being generated too, so it is a win-win. I didn't coordinate this with you as it evolved this week as it needed to move very quickly (using expiring funds). Please let me know if this causes any concerns or if you have questions.

As an update, NRMRL is testing a diesel truck next week and then a second, high production LDGV and after that, the  with ethanol-free fuel. From there, a second HDDT will be tested.

We have three people visiting the NRMRL lab this coming week so that they can return with all the info needed to facilitate our ability to sample into summa canisters. Here in Ann Arbor, we are going to be testing nonroad engines and additional on-road vehicles as needed to evaluate different aftertreatments and temperatures and to start to understanding how it is being formed and what mitigation might work.

Let me know if you'd like more information or want to be engaged in testing plans as they develop.

Marion



## MONTHLY PROGRESS REPORT

Research Laboratory Support for the EPA ORD at RTP, NC

Contract No. EP-C-15-008

### Work Assignment No. 4-034

Mobile Source Emissions Measurement and Characterization

EPA WACOR: **Thomas Long**  
 Jacobs WAL: **Craig Williams**  
 Reporting Period: **November 2019** (10/26/2019 – 11/22/2019)  
 Period of Performance: 4/1/2019 – 3/31/2020

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### SUMMARY

The purpose of this U.S. Environmental Protection Agency (EPA) Work Assignment (WA) is to generate new emissions data from up to two vehicles satisfying Office of Transportation and Air Quality (OTAQ) requirements for new Motor Vehicle Emission Simulator (MOVES) data. Chassis dynamometer driving cycles will consist of one Heavy-Duty Urban Dynamometer Driving Schedule (HD-UDDS) test protocol (<https://www.epa.gov/sites/production/files/2015-10/huddscol.txt>) and three repetitions of a locally developed cycle which is approximately 20 minutes in duration. These driving cycles will be repeated until nine valid data sets are created for each vehicle. On road measurements with a portable emissions measurement system (PEMS) unit will be made over the road. Each of two routes is expected to be completed in two working days. This will require a total of up to eight days of on-road testing (including set up and break down days).

### PROGRESS THIS PERIOD

- Received Method TO-15, Method 3C, and ethylene oxide (EtO) analyses results from 16 summa canister samples collected during Round 5 testing.
- Submitted purchase orders for supplies and analyses for Round 6 testing.
- Provided Round 6 sampling support for testing in the light-duty dynamometer facility. Jacobs provided methanol/ethanol sampling and analyses support, SUMMA canister sampling support and support for analyses of (EtO), TO-15, and EPA Method 3C.
- Received and installed the replacement variable frequency drive (VFD) in the Heavy-Duty Dynamometer Facility.
- Received delivery and installed the light-duty chassis dynamometer “system B” compressor.
- Discovered the California Analytical Instruments (CAI) model 700 heated chemiluminescent detector (HCLD) analyzer received last reporting period didn't come with optional zero/span valves and notified CAI. The sales manager indicated that they should've built the replacement analyzer to specifications of the old one and, since they did not, they will make it right. Waiting for further instructions from CAI on how to proceed.
- Analyses of ethanol/methanol samples from Round 5 testing indicated high methanol background in the previously determined “methanol free” water source used in the impingers. It is believed the methanol background is coming from new deionized water system cartridges that had been recently replaced. Located another source for water in the D584 laboratory from the Milli-Q water treatment system. It's been tested and determined methanol free and was used in Round 6 sampling.



## MONTHLY PROGRESS REPORT

Research Laboratory Support for the EPA ORD at RTP, NC

Contract No. EP-C-15-008

- Attended a meeting with the WACOR to discuss plans for the Small Engine Dynamometer facility. Plans were discussed to proceed with replacing the dilution/sample tunnel and ideas were discussed for making new engine mounting plates for the small engine dynamometer test stand.
- Attended a meeting with the Jacobs shop staff and an EPA dynamometer technician to discuss ideas for making engine mounting plates for the small engine dynamometer test stand.
- Contacted and received a quote for three 5-foot long, 8" diameter tubes made from 16-gauge, 316 stainless steel (SS) to be used for the small engine dynamometer tunnel.
- Contacted and requested a quote for electropolishing the tubes for the small engine dynamometer tunnel.
- The computer for the gas chromatograph/mass spectrometer (GC/MS) system used for methanol/ethanol analyses started locking up. Contacted EPA computer support who diagnosed the problem to be a RAM memory issue. Purchased eight 4GB RAM kits and will try to try resolve the issue after the kits are received.
- Received a quote for a "Portable Emissions Measurement System" (PEMS), submitted a sole source justification and a purchase order.
- Notified the WACOR that the static eliminators in the H130 weigh-room are due for replacement.
- Received a quote and purchased the following:
  - Luer connectors and fluorinated ethylene propylene (FEP) wash bottles.
  - High-efficiency permeate pumped reverse osmosis (RO) system to replace one that failed in the weigh-room in room H130. The system is used to supply water to the weigh-room humidification system.
- Received the following items:
  - Copper gaskets for the heavy-duty dynamometer facility.
  - Meriam laminar flow element (LFE) after cleaning and calibration.
  - Received three exhaust flow meters from Sensors Inc. after calibration and repairs. Serial numbers: H13110123, E18507275, and E18507276.
  - EPA protocol gas cylinder of 4500ppm Carbon dioxide in nitrogen.

### **PROGRESS ANTICIPATED NEXT PERIOD**

- Receive Method TO-15, Method 3C, and ethylene oxide (EtO) analyses results from 16 summa canister samples collected during Round 6 testing.
- Receive instructions from CAI on how to proceed to have them install the zero/span valves in the Model 700 HCLD analyzer.
- Purchase the 16-gauge, 316 SS tubes for small engine dynamometer tunnel.
- Build or purchase a new elbow from 16-gauge, 316 SS for the small engine dynamometer tunnel.
- Submit a shop request to install ports in the new small engine dynamometer tunnel and elbow.
- Receive a quote and electropolish the small engine dynamometer tunnel and elbow.
- Fabricate small engine mounting plates for the small engine dynamometer.



## MONTHLY PROGRESS REPORT

Research Laboratory Support for the EPA ORD at RTP, NC

Contract No. EP-C-15-008

- Receive and install the RAM kits for the methanol/ethanol system's GC/MS computer. Determine if the GC/MS system operates properly.
- Receive the new portable PEMS.
- Follow up on the static eliminators in the H130 weigh-room and place a purchase order if necessary.
- Support installation of the high efficiency permeate pumped RO system in the H130 weigh room.

### DIFFICULTIES ENCOUNTERED AND REMEDIAL ACTIONS TAKEN

- None.

### SCHEDULED DELIVERABLES/MILESTONES

Task	Deliverable/Milestone	Date Due	Status and Date
NA	Work plan and cost estimate, Amendment 1	4/29/2019	Submitted
NA	Work plan and cost estimate, Amendment 2	7/31/2019	Submitted 7/30/2019
NA	Monthly Progress Report	Ongoing	Ongoing
5	Emissions testing start	TBD upon receiving TD from the WACOR	
5	Emissions testing end	Three months after testing begins	
8	Infrastructure support allocation interim report	9/30/2019	WACOR authorized extension for submission and submitted on 10/04/2019
8	Infrastructure support allocation report	3/31/2020	

### QUALITY ASSURANCE ISSUES/STATUS

Jacobs will review and comply with the Quality Assurance Project Plan (QAPP), "Mobile Sources Emissions and Characterization," dated February 2016, provided by the WACOR. Any exceptions to the QAPP will be conveyed in writing to the WACOR.

### SAFETY INITIATIVES

All work and procedures were performed under the EPA Research Laboratory Support (RLS) Health and Safety Plan (HASP), Chemical Hygiene Plan, and Jacobs Beyond Zero Safety culture. All work was performed in accordance with all project-specific HASPs, job hazard analyses (JHAs), and procedures.

### EQUIPMENT FAILURES

- High-efficiency permeate pumped RO system.



**MONTHLY PROGRESS REPORT**  
Research Laboratory Support for the EPA ORD at RTP, NC  
Contract No. EP-C-15-008

**OUTSTANDING ACTIONS AWAITING CONTRACT OFFICER AUTHORIZATION**

- None.

# Ex. 4 CBI





US ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK FINANCIAL MANAGEMENT CENTER  
MAIL CODE MD-32  
RESEARCH TRIANGLE PARK, NC 27711

SF 1035, Labor Hours By Employee, Voucher EPATP-408 and EPATP-408C  
Contract Number: EP-C-15-008, Billing Period: 10/26/2019 to 11/22/2019

WA-4-034

**Ex. 4 CBI**

## Burdened Labor by WBS



Report Date and Time 11/26/2019 13:37:48

Project: WA-4-034 Mobile Source Emissions  
Manager: Williams, Craig  
Run Date: 10/26/2019 – 11/22/2019

# Ex. 4 CBI

# Ex. 4 CBI

Message

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**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 6/7/2019 2:01:57 PM  
**To:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**CC:** David Berkowitz [david.berkowitz@enthalpy.com]; Thorne Gregory [thorne.gregory@enthalpy.com]; Long, Thomas [Long.Thomas@epa.gov]; Snow, Richard [Snow.Richard@epa.gov]  
**Subject:** RE: Phase 2 - 0.1 ppb Quote  
**Attachments:** ATT00001.txt

Hi Bryan,  
EPA has encounter some delays in testing this week and performed test 1 on Wednesday. Then an equipment failure issue prevented further testing this week. The plan is to complete Phase 2 testing Tuesday and Wednesday, June 11th and 12th. Assuming all goes well we be contacting you Wednesday about delivering the cans on Thursday.

Thanks


**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
An employee-owned company  
Contractor to the USEPA

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Thursday, May 30, 2019 4:09 PM  
**To:** Craig Williams  
**Cc:** David Berkowitz; Thorne Gregory  
**Subject:** RE: Phase 2 - 0.1 ppb Quote

They are ~200 cc/min. I just checked and they range from 180-205 cc/min...for the 1060 second samples they will work well and leave a nice vacuum on the canister which is good.

Bryan Tyler  
Vice President Environmental

  
800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Thursday, May 30, 2019 4:07 PM  
**To:** Bryan Tyler <bryan.tyler@enthalpy.com>  
**Cc:** David Berkowitz <david.berkowitz@enthalpy.com>; Thorne Gregory <thorne.gregory@enthalpy.com>  
**Subject:** RE: Phase 2 - 0.1 ppb Quote

Hi Bryan,  
11am is fine for delivery. I'm checking with Tom about the number of controllers and waiting for a response. In your reply today you stated:

- 5 x Soil Gas Samplers @ 200 cc/min (individual 0.05 ppb TO-15)

Below in the quote on 5/22/2019 you stated:

- 5 x 250 cc/min Canister Samplers

Which is correct? 200 cc/min or 250 cc/min?

Craig

**Craig Williams**

Engineer

**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**

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---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]

**Sent:** Thursday, May 30, 2019 3:42 PM

**To:** Craig Williams

**Cc:** David Berkowitz; Thorne Gregory

**Subject:** RE: Phase 2 - 0.1 ppb Quote

Craig,

Does 11am tomorrow work for you? Below is the order per the quote:

- 18 x 6L Silco canisters (batch 0.05 ppb TO-15)
- 5 x Soil Gas Samplers @ 200 cc/min (individual 0.05 ppb TO-15)

Let me know if you need us to scramble for more controllers (might not be possible but we can check).

Bryan Tyler

Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713

O: 919.850.4392 x12203 | M: 919.491.5145

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>

**Sent:** Thursday, May 30, 2019 3:21 PM

**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Cc:** David Berkowitz <[david.berkowitz@enthalpy.com](mailto:david.berkowitz@enthalpy.com)>; Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>

**Subject:** RE: Phase 2 - 0.1 ppb Quote

Bryan,

Please ask the person delivering to give me at least a 30-minute heads up. Like last time, please have them tell the security guards that your dropping off items for me at the High Bay Building and I'll meet them in front of the high bay building.

Confirming that we're to receive 15 canisters and 13 controllers for 1060 seconds.

My cell is Ex. 6 Personal Privacy (PP)

Thanks

**Craig Williams**

Engineer

**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**

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**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]

**Sent:** Wednesday, May 29, 2019 11:14 AM

**To:** Craig Williams

**Cc:** David Berkowitz; Thorne Gregory

**Subject:** RE: Phase 2 - 0.1 ppb Quote

Everything is on schedule for 5/31 delivery.

Bryan Tyler

Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713

O: 919.850.4392 x12203 | M: 919.491.5145

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>

**Sent:** Wednesday, May 29, 2019 9:23 AM

**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Cc:** David Berkowitz <[david.berkowitz@enthalpy.com](mailto:david.berkowitz@enthalpy.com)>; Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>

**Subject:** RE: Phase 2 - 0.1 ppb Quote

Hi Bryan,

Thanks, I received Phase 3 & 4 quotes and we're looking them over.

How are preparations going for cans and controllers for Phase 2 and for Friday, May 31 delivery?

Thanks

**Craig Williams**

Engineer

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---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]

**Sent:** Thursday, May 23, 2019 2:26 PM

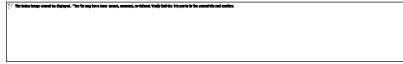
**To:** Craig Williams

**Cc:** David Berkowitz; Thorne Gregory

**Subject:** RE: Phase 2 - 0.1 ppb Quote

Thank you Craig – I will get phase 3 & 4 quotes to you by the end of the week.

Bryan Tyler  
Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Sent:** Thursday, May 23, 2019 2:02 PM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Cc:** David Berkowitz <[david.berkowitz@enthalpy.com](mailto:david.berkowitz@enthalpy.com)>; Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>  
**Subject:** RE: Phase 2 - 0.1 ppb Quote

Hi Bryan,  
We've reviewed the quotes and I've sent two purchase requisitions to Crystal. You should receive a PO soon.

Thanks

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Wednesday, May 22, 2019 9:21 AM  
**To:** Craig Williams  
**Cc:** David Berkowitz; Thorne Gregory  
**Subject:** Phase 2 - 0.1 ppb Quote

Hi Craig,  
See proposal for Phase 2 0.1ppb.

**Phase 2 Scope:**

Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment operating at 21 °C. Ultra-low sulfur diesel fuel. Heavy-duty dynamometer facility. 3 replicates of source for each condition.

Condition 1: Cold start HD-UDDS (5.5 miles)

Condition 2: Warm start HD-UDDS (5.5 miles)

Both conditions will be tested on each of 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One blank will be taken.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked → 15 total  
4 controllers for 1060 seconds for two of the three days  
5 controller for 1060 seconds for the third day  
Duration for all cans is 1060 seconds.

**Enthalpy Proposal, 0.1 ppb:**

Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

After samples have been analyzed at a 10 ppb RL if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high NOx, VOCs, CO, CO2, or other combustion products) or instrument operational viability becomes compromised. Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1ppb due to the risks involved in pushing the instrumentation past that level are significant.

Ex. 5 Deliberative Process (DP)

which includes the analysis GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

**Supplies to be ready on 6/6/2019:**

*Supplies provided by Enthalpy:*

- 18 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 250 cc/min Canister Samplers

Bryan Tyler  
Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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## Message

**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 6/5/2019 6:38:25 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**Subject:** FW: Phase 3 - 10 ppb Quote  
**Attachments:** ATT00001.txt

Hi Tom,  
You replied to the Phase 3 0.1 ppb. Just making sure you've seen the Phase 3 10ppb quote here. Please reply when you have a chance to look it over and let me know if everything looks OK.

**Craig Williams**  
Engineer  
CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)  
An employee-owned company  
Contractor to the USEPA

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Friday, May 24, 2019 11:48 AM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; David Berkowitz  
**Subject:** Phase 3 - 10 ppb Quote

Hi Craig,  
See proposal for Phase 3 10ppb.

**Phase 3 Scope:**

Naturally aspirated PFI light-duty vehicle, E10 cert fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 3 – 9 source, 13 ambient, 1 blank, 1 spike -> 24 total  
1 controller per day for cold start, source, 505 seconds.  
1 controller for each of two days for stabilized, source, 1372 seconds  
2 controllers for stabilized/spiked for the third day, source, 1372 seconds  
1 controller per day for source, US06, 600 seconds.  
2 controllers for background ambient per day, 1372 seconds  
2 controllers per day for background ambient for 600 seconds

**Enthalpy Proposal, 10 ppb:**

Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, EPA Method TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Scan mode.

We anticipate analyzing approximately 24 canisters collected from active combustion sources at a 20x dilution with an expected reporting limit (RL) of 10ppb. In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10ppb reporting limit, and by EPA Method 3C (O2, CO2, Methane, CO) with a 0.10% reporting limit.

## Ex. 5 Deliberative Process (DP)

**Supplies to be ready on 6/13/2019:**

*Supplies provided by Enthalpy:*

- 28 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 550 cc/min Canister Samplers
- 5 x 200 cc/min Canister Samplers

Bryan Tyler  
Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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## Message

**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 5/29/2019 1:07:40 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**Subject:** FW: Phase 3 - 0.1 ppb Quote  
**Attachments:** ATT00001.txt

See quote below

**Craig Williams**  
 Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
 An employee-owned company  
 Contractor to the USEPA

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Friday, May 24, 2019 11:53 AM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; David Berkowitz  
**Subject:** Phase 3 - 0.1 ppb Quote

Hi Craig,  
 See proposal for Phase 3 0.1ppb.

**Phase 3 Scope:**

Naturally aspirated PFI light-duty vehicle, E10 cert fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 3 – 9 source, 13 ambient, 1 blank, 1 spike -> 24 total  
 1 controller per day for cold start, source, 505 seconds.  
 1 controller for each of two days for stabilized, source, 1372 seconds  
 2 controllers for stabilized/spiked for the third day, source, 1372 seconds  
 1 controller per day for source, US06, 600 seconds.  
 2 controllers for background ambient per day, 1372 seconds  
 2 controllers per day for background ambient for 600 seconds

**Enthalpy Proposal, 0.1 ppb:**

Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

After samples have been analyzed at a 10 ppb RL if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high NOx, VOCs, CO, CO2, or other combustion products) or instrument operational viability becomes compromised. Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1 ppb due to the risks involved in pushing the instrumentation past that level are significant.

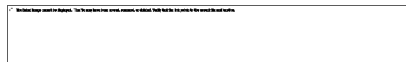
**Ex. 4 CBI**

**Supplies to be ready on 6/13/2019:**

*Supplies provided by Enthalpy:*

- 28 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 550 cc/min Canister Samplers
- 5 x 200 cc/min Canister Samplers

Bryan Tyler  
Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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## Message

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** 5/20/2019 9:46:28 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]; Craig Williams [CWilliams@css-inc.com]  
**CC:** Thorne Gregory [Thorne.Gregory@enthalpy.com]  
**Subject:** RE: VM  
**Attachments:** ATT00001.txt

Thank you.

Bryan Tyler  
 Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713  
 O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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---

**From:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Sent:** Monday, May 20, 2019 3:29 PM  
**To:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>; Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>  
**Subject:** RE: VM


Correction to Phases 3 and 4

#### Phase 3

Naturally aspirated PFI light-duty vehicle, E10 cert fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 3 – 9 source, 13 ambient, 1 blank, 1 spiked → 24 total  
 1 controller per day for cold start, source, 505 seconds.  
 1 controller for each of two days for stabilized, source, 1372 seconds  
 2 controllers for stabilized/spiked for the third day, source, 1372 seconds  
 1 controller per day for source, US06, 600 seconds.  
 2 controllers for background ambient per day, 1372 seconds  
 2 controllers per day for background ambient for 600 seconds

#### Phase 4

Turbocharged  (same vehicle as Phase 1). E0 fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 3 – 9 source, 13 ambient, 1 blank, 1 spiked → 24 total  
 1 controller per day for cold start, source, 505 seconds.  
 1 controller for each of two days for stabilized, source, 1372 seconds  
 2 controllers for stabilized/spiked for the third day, source, 1372 seconds  
 1 controller per day for source, US06, 600 seconds.  
 2 controllers for background ambient per day, 1372 seconds  
 2 controllers per day for background ambient for 600 seconds

---

Thomas Long, Mechanical Engineer

Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Long, Thomas  
**Sent:** Monday, May 20, 2019 1:54 PM  
**To:** Craig Williams <CWilliams@css-inc.com>; Bryan Tyler <bryan.tyler@enthalpy.com>  
**Cc:** Thorne Gregory <Thorne.Gregory@enthalpy.com>  
**Subject:** RE: VM

Look forward to speaking with you all in a few minutes. Due to the nature of our work we do not generally share the specific make or model of vehicles we test. So we would appreciate your keeping that information confidential.

Complete:

### Phase 1

Source: Light-duty SI vehicle

Dilution: Can 0098 was 30.16:1; Can 0080 was 18.99:1; Can 0001 was 21.18:1. The dilution ratio varied during Cans 0728, 0039, and 0066 in the range of 26:1.

Proposing:

### Phase 2

Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment operating at 21 °C. Ultra-low sulfur diesel fuel. Heavy-duty dynamometer facility. 3 replicates of source for each condition.

Condition 1: Cold start HD-UDDS (5.5 miles)

Condition 2: Warm start HD-UDDS (5.5 miles)

Both conditions will be tested on each of 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One blank will be taken.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked → 15 total

4 controllers for 1060 seconds for two of the three days

5 controller for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

### Phase 3

Naturally aspirated PFI light-duty vehicle, E10 cert fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 2 – 12 source, 13 ambient, 1 blank, 1 spiked → 27 total


1 controller per day for cold start, 505 seconds.

1 controller for each of two days for stabilized, 1372 seconds

2 controllers for stabilized/spiked for the third day, 1372 seconds

2 controllers for background ambient per day, 1372 seconds

### Phase 4

Turbocharged GDI  (same vehicle as Phase 1). E0 fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 4 -- 12 source, 13 ambient, 1 blank, 1 spiked → 27 total

1 controller per day for cold start, 505 seconds.  
1 controller for each of two days for stabilized, 1372 seconds  
2 controllers for stabilized/spiked for the third day, 1372 seconds  
2 controllers for background ambient per day, 1372 seconds

Note: We came up short on controllers for sampling on the spiked test in Phase 1.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Sent:** Monday, May 20, 2019 12:47 PM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Subject:** RE: VM

The source for the last round was the Ex. 5 Deliberative Process (DP) Gasoline Direct Injection Engine but for the next round I think they'll use a different fuel (e.g. low sulfur?). Tom will have to address this and the dilution more accurately.

Craig

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Monday, May 20, 2019 12:28 PM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; Long, Thomas  
**Subject:** RE: VM

Sounds good – I can send out a call-in # and invite. Can you let us know what the matrix (source and dilution) was for the last round of samples we did...that will be useful information for the discussion of the new sources to be tested.

Thanks,

Bryan Tyler  
Vice President Environmental



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O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)



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---

**From:** Craig Williams <CWilliams@css-inc.com>

**Sent:** Monday, May 20, 2019 12:27 PM

**To:** Bryan Tyler <bryan.tyler@enthalpy.com>

**Cc:** Thorne Gregory <Thorne.Gregory@enthalpy.com>; Long, Thomas <Long.Thomas@epa.gov>

**Subject:** RE: VM

Yes, 2:00 is Ok with me.

Tom,  
Are you available?

Thanks

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]

**Sent:** Monday, May 20, 2019 12:23 PM

**To:** Craig Williams

**Cc:** Thorne Gregory; Long, Thomas

**Subject:** Re: VM

I'm on calls 230-430, can we do 2?

On Mon, May 20, 2019, 11:56 AM Craig Williams <CWilliams@css-inc.com> wrote:

Hi Bryan,  
Are you available for a phone call with Jacobs and EPA today around 2:15 to 2:30?

Thanks

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]

**Sent:** Friday, May 17, 2019 3:23 PM

**To:** Craig Williams

**Cc:** Thorne Gregory; Long, Thomas

**Subject:** Re: VM

Thank you for the update, looking forward to it.

On Fri, May 17, 2019, 3:17 PM Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)> wrote:

Hi Bryan,

Yes, I certain that EPA would like the Method 3C and TO-15 but I'll confirm on Monday and schedule a call for the afternoon.

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]

**Sent:** Thursday, May 16, 2019 5:07 PM

**To:** Craig Williams

**Cc:** Thorne Gregory; Long, Thomas

**Subject:** RE: VM

Hi Craig,

This is very helpful – thank you. Should we all plan for a Monday afternoon call to discuss? We are discussing this project internally on Monday morning.

From the earlier data – it seems like the EPA goal would be a 50-100 ppt detection limit for the Ethylene oxide. Can you advise if that would meet program objectives.

Also, is the EPA Method 3C & TO-15 needed as well?

Sincerely,

Bryan Tyler  
Vice President Environmental

800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>

**Sent:** Thursday, May 16, 2019 3:45 PM

**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>

**Subject:** RE: VM

Hi Bryan,

It looks like we will have difficulty scheduling a conference call today or tomorrow morning and Tom is unavailable tomorrow afternoon. I've CC'd Tom here so he can elaborate on my answers and any additional follow up questions from you.

I'd like to add that the estimated cans per week would be 18-20, similar to what we did in April. Also I'd note that that heavy duty dynamometer facility will introduce more dilution to compensate for the additional exhaust from the larger diesel engines.

Will Enthalpy perform TO-15 analysis and EtO analysis similar to what was performed in April for 5 weeks of testing, about 100 SUMMA cans?

Thanks

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Craig Williams  
**Sent:** Thursday, May 16, 2019 2:58 PM  
**To:** Bryan Tyler  
**Cc:** Thorne Gregory  
**Subject:** RE: VM

Hi Bryan,  
I'll start out with the information I have.

Source type will be diluted exhaust from the EPA's small chassis dynamometer, same facility used in April, and EPA Heavy Duty Chassis dynamometer. Two vehicles with gasoline engines and two vehicles with diesel engines tested will be:

Ex. 5 Deliberative Process (DP) Diesel Class 6 or 7 truck - 1 week testing  
Class 8 Diesel tractor - 1 week testing  
Light Duty Vehicle (LDV) Direct Fuel Injection Engine - 2 weeks testing  
Ex. 5 Deliberative Process (DP) Gasoline Direct Injection Engine - 1 week testing

The two diesel trucks will operate on EPA heavy duty chassis dynamometer  
The LDV and the Ex. 5 Deliberative Process (DP) will operate on the EPA small chassis dynamometer

Expected concentrations for the Ex. 5 Deliberative Process (DP) are similar to tests completed in April. I think the LDV would be similar as well. We should more request information from EPA.

Detection limit similar to April. We should address this with EPA.

EPA would like to start testing with the Ex. 5 Deliberative Process (DP) diesel the week of May 27.

If your available today I suggest we schedule a conference call with EPA.

Thanks,

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)

1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Thursday, May 16, 2019 2:23 PM  
**To:** Craig Williams  
**Cc:** Thorne Gregory  
**Subject:** VM

Hi Craig,

Thank you for the VM – on calls all day. Can you let me know what type of samples will be collected. We need to know:

1. Source type
2. Ambient
3. Source
4. Expected concentrations
5. Detection limit needed
6. Testing schedule.
7. Anything and everything

Thank you,  
Bryan

Bryan Tyler  
Vice President Environmental

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[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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Message

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** 4/10/2019 11:09:38 AM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**Subject:** Re: Enthalpy EO Quote  
**Attachments:** image001.png

It's going to be difficult to have everything ready by then...what would the sampling schedule be?

On Wed, Apr 10, 2019, 6:44 AM Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)> wrote:

Yes, it is in E-building at RTP.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Sent:** Tuesday, April 09, 2019 12:56 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Subject:** RE: Enthalpy EO Quote

Is this sampling local?

*Please take a moment to provide customer feedback.*

**Bryan Tyler**  
Vice President  
Enthalpy Analytical, LLC  
800 Capitola Drive, Suite 1  
Durham, NC 27713  
(919) 850-4392  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

[www.enthalpy.com](http://www.enthalpy.com)

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SSAS Laboratory ID: L0036, L0149 (metals only)

---

**From:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Sent:** Tuesday, April 9, 2019 12:47 PM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Subject:** RE: Enthalpy EO Quote

Either this Friday or first thing Monday morning.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Sent:** Tuesday, April 09, 2019 12:45 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>; Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Subject:** RE: Enthalpy EO Quote

Thomas,

Thank you for the update. If this moves forward when would you like to have equipment in hand?

Best,  
Bryan

*Please take a moment to provide customer feedback.*

**Bryan Tyler**

Vice President

Enthalpy Analytical, LLC

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Durham, NC 27713

(919) 850-4392

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

[www.enthalpy.com](http://www.enthalpy.com)

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SSAS Laboratory ID: L0036, L0149 (metals only)

---

**From:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>

**Sent:** Tuesday, April 9, 2019 12:35 PM

**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>; Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>

**Subject:** RE: Enthalpy EO Quote

Bryan,

In yet another twist, the program office has decided to write the PR on our contract with Jacobs. So we'll be back to working with Craig if and when that PR comes through. I'm not counting my chickens, but I do hope to know something by tomorrow. I should have known nothing would be as straightforward as it was originally presented!

---

Thomas Long, Mechanical Engineer

Mail Drop E343-02

Building D Room 360

109 T. W. Alexander Drive

Research Triangle Park, NC 27711

Phone: 919-541-3944



---

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Sent:** Monday, April 08, 2019 1:44 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Subject:** RE: Enthalpy EO Quote

Thank you Thomas.

*Please take a moment to provide customer feedback.*

**Bryan Tyler**

Vice President

Enthalpy Analytical, LLC

800 Capitola Drive, Suite 1

Durham, NC 27713

(919) 850-4392

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

[www.enthalpy.com](http://www.enthalpy.com)

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SSAS Laboratory ID: L0036, L0149 (metals only)

---

**From:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Sent:** Monday, April 8, 2019 12:50 PM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Subject:** RE: Enthalpy EO Quote

Bryan,

Thank you for the quote. I have forwarded it to the program office. If they find the terms agreeable, you should be hearing directly from them in short order.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Sent:** Monday, April 08, 2019 12:04 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>  
**Subject:** Enthalpy EO Quote

Dear Thomas,

As discussed you would like to engage Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0219-074). Samples will be collected into individually blank checks 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode.

We anticipate analyzing approximately 15 canisters collected from active combustion sources at a significant dilution with an expected reporting limit (RL) of 10ppb. After all samples have been analyzed at the first dilution (10 ppb RL), if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high CO/CO<sub>2</sub>, combustion products) or instrument operational viability becomes compromised.

Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1ppb due to the risks involved in pushing the instrumentation past that level are significant.

In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10 ppb reporting limit and by EPA Method 3C (O<sub>2</sub>, CO<sub>2</sub>, Methane, CO) with a 0.10% reporting limit. See attached TO-15 target compound list.

## Ex. 4 CBI

Please let me know ASAP if you will be moving forward with this project.

Kind Regards,  
Bryan

*Please take a moment to provide customer feedback.*

**Bryan Tyler**  
Vice President  
Enthalpy Analytical, LLC  
800 Capitola Drive, Suite 1  
Durham, NC 27713  
(919) 850-4392  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)  
[www.enthalpy.com](http://www.enthalpy.com)

Terms and Conditions

Enthalpy Sample Acceptance Policy

SSAS Laboratory ID: L0036, L0149 (metals only)

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## MONTHLY PROGRESS REPORT

Research Laboratory Support for the EPA ORD at RTP, NC  
Contract No. EP-C-15-008

### Work Assignment No. 4-034

Mobile Source Emissions Measurement and Characterization

EPA WACOR: **Thomas Long**  
Jacobs WAL: **Craig Williams**  
Reporting Period: **October 2019 (9/28/2019 – 10/25/2019)**  
Period of Performance: **4/1/2019 – 3/31/2020**

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### SUMMARY

The purpose of this U.S. Environmental Protection Agency (EPA) Work Assignment (WA) is to generate new emissions data from up to two vehicles satisfying Office of Transportation and Air Quality (OTAQ) requirements for new Motor Vehicle Emission Simulator (MOVES) data. Chassis dynamometer driving cycles will consist of one Heavy-Duty Urban Dynamometer Driving Schedule (HD-UDDS) test protocol (<https://www.epa.gov/sites/production/files/2015-10/huddscol.txt>) and three repetitions of a locally developed cycle which is approximately 20 minutes in duration. These driving cycles will be repeated until nine valid data sets are created for each vehicle. On road measurements with a portable emissions measurement system (PEMS) unit will be made over the road. Each of two routes is expected to be completed in two working days. This will require a total of up to eight days of on-road testing (including set up and break down days).

### PROGRESS THIS PERIOD

- Received a quote and rented a heavy-duty gasoline truck for Round 5 testing.
- Provided Round 5 sampling support for testing in the heavy-duty dynamometer facility. Jacobs provided methanol/ethanol sampling and analyses support, SUMMA canister sampling support and support for analyses of ethylene oxide (EtO), TO-15, and EPA Method 3C.
- Received Work Assignment Contracting Officer's Representative (WACOR) notification for Round 6 testing scheduled for the next reporting period. Requested quotes for Round 6 sampling supplies and analyses to include Method TO-15, Method 3C, and EtO.
- Received a quote and purchased the following:
  - EPA protocol gas cylinder containing 4500-ppm carbon dioxide in nitrogen.
  - Copper gaskets for the heavy-duty dynamometer facility
- Received the following items:
  - Carrier demodulator (electronics that support a variable reluctance pressure transducer)
  - California Analytical Instruments (CAI) model 700 chemiluminescent detector (HCLD) nitric oxide (NO)/oxides of nitrogen (NOX) analyzer
  - High temperature pump for a California Analytical Instruments (CAI) model 600 heated HCLD.
  - Filament for model 5973 gas chromatograph / mass spectrometer (GC/MS).
  - Six brass gas cylinder regulators (2 CGA 580, 2 CGA 590, 2 CGA 350).
  - Digital smart manometer.

- Submitted a purchase order with a quote, and a return material authorization (RMA) number for calibration of a Meriam laminar flow element (LFE). Shipped the LFE to Meriam for cleaning and calibration.
- Received a quote for replacing the system B compressor in room E180. Submitted a purchase order (PO), quote and sole source justification for the system B compressor.
- Submitted a purchase order and delivered three exhaust flow meters to Sensors Inc. for calibration, serial numbers: H13110123, E18507275, and E18507276. Submitted a PO change order for additional repairs needed.

#### **PROGRESS ANTICIPATED NEXT PERIOD**

- Receive variable frequency drive (VFD) to replace a unit with the failing and obsolete keypad in the Heavy-Duty Dynamometer Facility
- Purchase three dual stage filter holders and nine single stage filter holders pending direction from the WACOR to proceed
- Prepare for Round 6 sampling support for testing on the light-duty dynamometer facility.
- Replace light-duty chassis dynamometer system B compressor.
- Receive Sensors Inc. exhaust flow meters after completing calibrations.
- Receive Meriam LFE after cleaning and calibration.
- Receive copper gaskets for the heavy-duty dynamometer facility
- Initiate fabrication of a mounting plate for the small-engine dynamometer and mounting plates for small test engines.

#### **DIFFICULTIES ENCOUNTERED AND REMEDIAL ACTIONS TAKEN**

- None.

#### **SCHEDULED DELIVERABLES/MILESTONES**

Task	Deliverable/Milestone	Date Due	Status and Date
NA	Work plan and cost estimate, Amendment 1	4/29/2019	Submitted
NA	Work plan and cost estimate, Amendment 2	7/31/2019	Submitted 7/30/2019
NA	Monthly Progress Report	Ongoing	Ongoing
5	Emissions testing start	TBD upon receiving TD from the WACOR	
5	Emissions testing end	Three months after testing begins	
8	Infrastructure support allocation interim report	9/30/2019	WACOR authorized extension for submission and submitted on 10/04/2019
8	Infrastructure support allocation report	3/31/2020	

**QUALITY ASSURANCE ISSUES/STATUS**

Jacobs will review and comply with the Quality Assurance Project Plan (QAPP), "Mobile Sources Emissions and Characterization," dated February 2016, provided by the WACOR. Any exceptions to the QAPP will be conveyed in writing to the WACOR.

**SAFETY INITIATIVES**

All work and procedures were performed under the EPA Research Laboratory Support (RLS) Health and Safety Plan (HASP), Chemical Hygiene Plan, and Jacobs Beyond Zero Safety culture. All work was performed in accordance with all project-specific HASPs, job hazard analyses (JHAs), and procedures.

**EQUIPMENT FAILURES**

- None

**OUTSTANDING ACTIONS AWAITING CONTRACT OFFICER AUTHORIZATION**

- None.

# Ex. 4 CBI





US ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK FINANCIAL MANAGEMENT CENTER  
MAIL CODE MD-32  
RESEARCH TRIANGLE PARK, NC 27711

SF 1035, Labor Hours By Employee, Voucher EPATP-407

Contract Number: EP-C-15-008, Billing Period: 09/28/2019 to 10/25/2019

WA-4-034

**Ex. 4 CBI**

# Ex. 4 CBI

## Burdened Direct Cost by WBS



Report Date and Time 10/29/2019 8:24:06

Project: WA-4-034 Mobile Source Emissions  
Manager: Williams, Craig  
Run Dates: 09/28/2019 - 10/25/2019

# Ex. 4 CBI

## Message

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** 5/17/2019 7:23:56 PM  
**To:** Craig Williams [CWilliams@css-inc.com]  
**CC:** Thorne Gregory [Thorne.Gregory@enthalpy.com]; Long, Thomas [Long.Thomas@epa.gov]  
**Subject:** Re: VM  
**Attachments:** ATT00001.txt

Thank you for the update, looking forward to it.

On Fri, May 17, 2019, 3:17 PM Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)> wrote:

Hi Bryan,

Yes, I certain that EPA would like the Method 3C and TO-15 but I'll confirm on Monday and schedule a call for the afternoon.

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Thursday, May 16, 2019 5:07 PM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; Long, Thomas  
**Subject:** RE: VM

Hi Craig,

This is very helpful – thank you. Should we all plan for a Monday afternoon call to discuss? We are discussing this project internally on Monday morning.

From the earlier data – it seems like the EPA goal would be a 50-100 ppt detection limit for the Ethylene oxide. Can you advise if that would meet program objectives.

Also, is the EPA Method 3C & TO-15 needed as well?

Sincerely,

Bryan Tyler  
Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>

**Sent:** Thursday, May 16, 2019 3:45 PM

**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>

**Subject:** RE: VM

Hi Bryan,

It looks like we will have difficulty scheduling a conference call today or tomorrow morning and Tom is unavailable tomorrow afternoon. I've CC'd Tom here so he can elaborate on my answers and any additional follow up questions from you.

I'd like to add that the estimated cans per week would be 18-20, similar to what we did in April. Also I'd note that that heavy duty dynamometer facility will introduce more dilution to compensate for the additional exhaust from the larger diesel engines.

Will Enthalpy perform TO-15 analysis and EtO analysis similar to what was performed in April for 5 weeks of testing, about 100 SUMMA cans?

Thanks

Craig Williams

Senior Engineer

Contractor to the USEPA

CSS (Jacobs Teammate)

1910 Sedwick Road

Durham, NC 27713

Office Phone: (919) 541-0336

[www.css-inc.com](http://www.css-inc.com)

---

**From:** Craig Williams

**Sent:** Thursday, May 16, 2019 2:58 PM

**To:** Bryan Tyler

**Cc:** Thorne Gregory

**Subject:** RE: VM

Hi Bryan,

I'll start out with the information I have.

Source type will be diluted exhaust from the EPA's small chassis dynamometer, same facility used in April, and EPA Heavy Duty Chassis dynamometer. Two vehicles with gasoline engines and two vehicles with diesel engines tested will be:

Ex. 5 Deliberative Process (DP)	Diesel Class 6 or 7 truck - 1 week testing
	Class 8 Diesel tractor - 1 week testing

Light Duty Vehicle (LDV) Direct Fuel Injection Engine - 2 weeks testing

Ex. 5 Deliberative Process (DP) Gasoline Direct Injection Engine - 1 week testing

The two diesel trucks will operate on EPA heavy duty chassis dynamometer

The LDV and the  will operate on the EPA small chassis dynamometer

Expected concentrations for the  are similar to tests completed in April. I think the LDV would be similar as well. We should more request information from EPA.

Detection limit similar to April. We should address this with EPA.

EPA would like to start testing with the  diesel the week of May 27.

If your available today I suggest we schedule a conference call with EPA.

Thanks,

Craig Williams

Senior Engineer

Contractor to the USEPA

CSS (Jacobs Teammate)

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Durham, NC 27713

Office Phone: (919) 541-0336

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**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]

**Sent:** Thursday, May 16, 2019 2:23 PM

**To:** Craig Williams

**Cc:** Thorne Gregory

**Subject:** VM

Hi Craig,

Thank you for the VM – on calls all day. Can you let me know what type of samples will be collected. We need to know:

1. Source type
2. Ambient
3. Source
4. Expected concentrations
5. Detection limit needed
6. Testing schedule.
7. Anything and everything

Thank you,  
Bryan

Bryan Tyler  
Vice President Environmental



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## Message

**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 5/16/2019 7:45:29 PM  
**To:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**CC:** Thorne Gregory [Thorne.Gregory@enthalpy.com]; Long, Thomas [Long.Thomas@epa.gov]  
**Subject:** RE: VM  
**Attachments:** ATT00001.txt

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Craig Williams  
 Senior Engineer  
 Contractor to the USEPA  
 CSS (Jacobs Teammate)  
 1910 Sedwick Road  
 Durham, NC 27713  
 Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

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Detection limit similar to April. We should address this with EPA.



EPA would like to start testing with the [REDACTED] diesel the week of May 27.

If your available today I suggest we schedule a conference call with EPA.

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Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
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6. Testing schedule.
7. Anything and everything

Thank you,  
Bryan

Bryan Tyler  
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**Jacobs Technology Inc. EPA RLS Support**

## **WA 4-034: Mobile Source Emissions and Characterization**

### **Work Plan**

Contract Number: **EP-C-15-008**

Work Assignment (WA) Number: **4-034** Amendment: **1**

WA Leader: **Craig Williams**

WA Contracting Officer's Representative: **Thomas Long**

Period of Performance: **4/1/2019 to 3/31/2020**

Work Plan Due Date: **4/29/2019**

Work Plan Submission Date: **4/26/2018**

## **1. Overview**

This Work Assignment (WA) will provide support to the U.S. Environmental Protection Agency (EPA), and is in response to Amendment 1 to the original Performance Work Statement (PWS) received prior to submitting the original Work Plan. Amendment 1 adds scope to include Ethylene Oxide (EtO) sampling and analysis.

### **1.1 Summary of Objectives**

EPA's Motor Vehicle Emissions Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria air pollutants, greenhouse gases, and air toxics. This project will generate emissions data from up to two vehicles that satisfy the Office of Transportation and Air Quality (OTAQ) requirements for new MOVES data. Chassis dynamometer driving cycles will consist of one Heavy Duty Urban Dynamometer Driving Schedule (HD-UDDS) test protocol (<https://www.epa.gov/sites/production/files/2015-10/huddscol.txt>) and three repetitions of a locally developed driving cycle which is approximately 20 minutes in duration. The objective is to generate and sample emissions data that will be included in an already existing database with the hope to provide insight into whether it is necessary to modify MOVES to improve emissions factors or to fill similar gaps in represented emission factors.

## **2. Technical Approach**

The project has been designed to fill data gaps or improve existing emission factors for the case of Heavy-Duty Trucks (HDT), Medium Heavy-Duty Trucks (MHDT), or Gas Direct Injection (GDI) vehicles.

- Chassis dynamometer testing will be conducted on up to two heavy-duty vehicles (HDVs) tested at an ambient temperature of 70° F.
- Chassis dynamometer test cycles will include various operating phases; a cold start California Air Resources Board (CARB) transient cycle, a warm start HD-UDDS, two World Harmonized Vehicle Cycles (WHVC), and three warm start Mobile Source Distributed Power Driving Schedules (MSDPDS) designed to generate data in each of the modes represented in the MOVES model.
- Core dynamometer bench measurements will include total hydrocarbon (THC), non-methane hydrocarbons (NMHC), non-methane organic gas (NMOG), oxides of nitrogen (NO<sub>x</sub>), nitrogen dioxide (NO<sub>2</sub>), Carbon Monoxide (CO), carbon dioxide (CO<sub>2</sub>), and particulate matter (PM).
- Chassis dynamometer testing will generate speciated volatile organic compound (speciated VOC) data.

**2.1 Task 1: (Reserved by Work Assignment Contracting Officer's Representative [WACOR])****2.2 Task 2: (Reserved by the WACOR)****2.3 Task 3: Test Fuels and Lubrication**

Jacobs provided 400 gallons of on-road diesel fuel from a single batch during the preceding option period under WA-3-034 as directed by the EPA WACOR. Jacobs has not included in this budget estimate and does not anticipate a need to buy more fuel. If the WACOR provides Technical Direction (TD) to purchase more fuel, Jacobs will assist the WACOR in locating and purchasing the fuel specified if funding is available at that time. If additional funding is required, a revised budget will be submitted. Jacobs will procure services with a laboratory for providing analyses of the fuels before and after testing. This work plan estimate includes funds for 10 fuel and lubricant samples. Jacobs will purchase additional analyses if sufficient funds allow.

**2.4 Task 4: Vehicle Procurement and Preparation**

Through conversations with the WACOR, EPA currently intends to perform many tasks associated with vehicle procurement and preparation. Technical direction to perform these tasks may require submission of a revised work plan estimate.

Jacobs initiated a search during the last option period under WA-3-034 to locate a test vehicle for leasing based on specifications provided by the WACOR and will continue the effort under this WA after receiving notification from the WACOR that the dynamometer repairs by EPA are complete and the dynamometer is ready for testing. The lease will span the duration from test preparation to on-road testing by EPA personnel. The lease period is expected to last 11-weeks total. Jacobs will supply an insurance certificate for liability and physical damage. Jacobs will provide emissions sampling support to test a second vehicle if TD is received by the WACOR. The second vehicle, if tested, will be provided by EPA.

Jacobs will perform a thorough inspection before beginning the test preparation sequence. This includes inspection and documentation of the engine, transmission, axles, exhaust system and tires, and documentation of the engine control module (ECM) status, if available, on that vehicle. Jacobs will prepare titled photographs of the vehicle exhaust systems, engine plates, and emissions plates and will include them as part of the infrastructure support allocation progress and final reports. Photographs of the vehicle mounted to the chassis dynamometer will also be included. Jacobs will collect and record vehicle information as described in the Quality Assurance Project Plan (QAPP).

Jacobs will assist with the performance of on-road coast-down tests pending contract officer approval.

## **Ex. 4 CBI**

Jacobs will perform initial crankcase, oil filter, and air filter replacement. Oil and air filters will be procured by Jacobs according to manufacturer recommendations. Engine oil recommended in the owner's manual of each vehicle will be used. Jacobs will purchase the recommended grade of lubricant.

After the last test of each vehicle in the program, Jacobs will record the lubricant level indicated on the dipstick before collecting a 0.25-quart of oil for sample analysis (lubricant testing in Task 3).

If any of the vehicles are equipped with traction control, Jacobs will ensure that the traction control is disabled either through an interior disable button or other method (i.e., remove power fuse to anti-lock braking system (ABS)), and place a placard in the vehicle indicating the method of disabling the traction control if driver input is required.

Jacobs will be provided target road load coefficients by the WACOR and set load coefficients for the test vehicles according to 40 Code of Federal Regulations (CFR) 1066.301 and 40 CFR 1066.310 (or Jacobs will propose and use an alternate method, subject to approval by EPA). For the purpose of this study, the agreed road load setting method will remain the same for all testing on a given vehicle.

Jacobs will provide hardware and software for reading and archiving vehicle ECM data during testing.

**Ex. 4 CBI**

If additional hardware or software is required, then a revised budget may be needed. Additionally, if purchasing and receiving additional equipment or software causes a delay in the capability of acquiring ECM data for the tests, then a revised test and deliverables schedule may be needed.

## **2.5 Task 5: Vehicle Testing**

### **2.5.1 Basic Testing Protocol**

Through conversations with the WACOR, EPA intends to perform many tasks associated with vehicle testing. Technical direction to perform these tasks may require submission of a revised work plan estimate.

Jacobs will provide support for dynamometer testing, for both Light Duty Vehicles (LDVs) and HDVs, following a protocol that includes various operating phases. The LDV and HDV protocols begin with a cold start CARB transient cycle, a HD-UDDS, two WHVC, and three warm start MSDPDS. Jacobs will provide support for Light duty vehicle testing in compliance with CFR Part 86, Subpart C, CFR Part 1065, and CFR part 1066. For MHDT and HDT, the HD-UDDS will be conducted in compliance with CFR Part 86 Subpart N, and CFR Part 1065 (No MHDT testing is expected to occur during this period of performance).

This work plan estimate covers the following tests at the listed conditions. The WACOR will define the duration subsets of the driving cycles for each test for Jacobs to provide sampling support. Note that all LDV testing will be conducted under Task 8.

Twelve project tests (including two repeat tests) for up to two HDVs, one provided by Jacobs, the second provided by EPA. The sequence above will be performed in both laden (six tests) and unladen (six tests) conditions, at an ambient temperature of 70 °F (20 °).

HDV tests will be performed on the 72-inch, single-roll electric heavy-duty chassis dynamometer. Jacobs will provide one person with test experience to provide technical support during sampling and general set up and tear down. LDV test will be performed on the 48-inch, single-roll light-duty chassis dynamometer. It is anticipated that EPA will provide the same driver to be used for all tests on a given vehicle.

Funding has been included in the estimate to support conducting the measurements below and to provide the consumables for sampling. Jacobs will support performing the following.

- Measure and report gaseous emissions for THC, methane (CH<sub>4</sub>), NO<sub>x</sub> NO<sub>2</sub>, CO, and CO<sub>2</sub> as specified in 40 CFR Part 1065. EPA will provide an operational system for measuring these gaseous emissions including an NO<sub>2</sub> analyzer with a minimum detection limit of 5ppb.
- collect samples using cleaned SUMMA cans, provided by EPA, from which the US EPA will speciate VOCs.

- Use EPA provided instrumentation to analyze for speciated oxygenates as per CARB 1001. This work

**Ex. 4 CBI**

- Provide polyurethane foam (PUF) sorbent plugs or their equivalent as approved by the WACOR and collect samples on which EPA will conduct analyses.
- Provide Teflon filters for EPA to collect samples and perform gravimetric analyses.
- Provide quartz filters on which EPA will conduct chemical analyses.
- Provide 2,4-dinitrophenylhydrazine (DNPH) cartridges and collect samples on which EPA will conduct carbonyl analyses.

During all emissions tests, Jacobs will record the following ECM parameters if available for the vehicle at a rate of 1 Hz. Jacobs will supply and/or procure the data acquisition equipment.

- RPM
- Vehicle speed
- Engine load
- MIL status
- Absolute throttle position
- Engine coolant temperature
- Short-term fuel trim-bank 2
- Long term fuel trim-bank 2
- Fuel/air commanded equivalence ratio
- Alcohol fuel present
- Manifold absolute pressure
- Spark advance
- Proportional-Integral-Derivative (PID) control module voltage
- Air flow rate from mass air flow sensor

Jacobs will assist in maintaining the facilities for testing in conformance with the requirements of 40 CFR Part 86 Subparts C and N and 40 CFR Part 1066 as they apply to vehicle emissions testing. If some aspect of the testing needs to be performed in variance to the above specifications, Jacobs will describe why that is the case and how it may impact the test results. Variances will be approved by the WACOR before testing begins.

Jacobs will monitor the tunnel flow to ensure that it remains constant during the test. The constant volume sampling (CVS) blower will be kept on for one-half hour before the first emission test on a given day and continuously between emission tests to ensure tunnel stability.

Jacobs will provide and maintain cooling fan placement and air flow for each test vehicle on all tests. The flow of air sweeping the vehicle in the test cell will be consistent between tests.

Jacobs will perform “blank” tests at a maximum of one-month intervals or when test conditions change during the program. These tests will involve running the fuel test sequence drawing only background air into the sampling system. All sampling systems will be operated, and measurements will include the following.

- Operating-Phase level THC, CH<sub>4</sub>, NO<sub>x</sub>, NO<sub>2</sub>, CO, and CO<sub>2</sub>, PM, and VOCs (including alcohols and carbonyls)
- Continuous THC, CH<sub>4</sub>, NO<sub>x</sub>, CO, and CO<sub>2</sub>

Jacobs will provide a technician to support up to 21 days of portable emissions measurement systems (PEMS) testing and up to 60 days of chassis dynamometer testing.

### **2.5.2 Speciation of Volatile Organic Compounds, Dynamometer Tests**

Jacobs will perform sampling and analyses of alcohols using CARB Method 1001, “Determination of Alcohols in Automotive Source Samples by Gas Chromatography,” as modified by the miscellaneous operating procedure (MOP) included in the QAPP.

Sampling and analyses of carbonyl compounds will be performed using TO-11a “Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC).” Carbonyl sampling will be performed by Jacobs. Carbonyl analyses will be performed by EPA.

Jacobs will seal and store alcohol samples at a temperature below 40 °F immediately following collection. Jacobs will make every effort to analyze these samples on the day they are collected but no later than six calendar days.

As part of Amendment 1 to the original PWS, Jacobs will provide EPA Method TO-15 analyses including ethylene oxide (EtO) for up to 23 sample cans in accordance with the QAPP.

Jacobs will test no more than one vehicle per test day on the chassis dynamometer, unless Jacobs can demonstrate that the total number of vehicles tested on that day and the timing of their tests will not compromise the time limit requirements imposed on sample analyses.

### **2.5.3 (Reserved by the WACOR)**

### **2.5.4 PM Measurements and Analysis**

EPA will collect PM on a Teflon filter for mass determination and on a quartz filter for mass determination and subsequent chemical analyses for tests on the chassis dynamometer. Jacobs will assist the EPA with the sampling method to collect sufficient sample for chemical analyses. PM mass will be measured as specified in 40 CFR 1065. Two parallel filters will also collect samples for each operating phase. Testing will be conducted collecting PM samples in parallel. One set of filters will be at the certification filter face velocity of 100 cm/s and the other will be set to alternate speeds as specified by OTAQ. Other deviations from this method will require approval from the WACOR.

## **2.6 Task 6: Coordination and Support of Non-regulated Emissions Measurements**

### **2.6.1 UV-DOAS instrument (Reserved by the WACOR)**

### **2.6.2 Fourier Transform Infrared**

Jacobs will coordinate with Edgar Thompson, or his delegate, to conduct Fourier transform infrared (FTIR) measurements from a probe in the dilution tunnel.

### **2.6.3 Polycyclic Aromatic Hydrocarbons**

Jacobs will coordinate with Michael Hays, or his delegate, to provide sufficient media to sample polycyclic aromatic hydrocarbons (PAHs) for three of the five operating phases per test. This will include use of alternate absorbents to PUF or equivalent method to be approved by the WACOR.

### **2.6.4 Volatile Organic Compounds**

Jacobs will coordinate with the WACOR or designee to use sufficient clean and prepared SUMMA cans for VOC analyses for all five operating phases per test.

### **2.6.5 Metals**

Jacobs will coordinate with Michael Hays, or his delegate, to provide sufficient media for metals analyses on two of the five operating phases per test if the WACOR requests and sufficient funds allow. Based on conversations with the WACOR there will be no metals analyses on this project.

## **2.7 Task 7: Deliverables**

### **2.7.1 Work Plan**

Jacobs will submit a work plan for this WA.



**2.7.2 Infrastructure Support Allocation Report**

Jacobs will provide an interim and final infrastructure report detailing the level-of-effort hours and direct costs expended to support Task 8. Each report will not exceed one-page of narrative and provide a brief statement of what was accomplished.

**2.7.3 (Reserved by the WACOR)****2.7.4 Monthly Reports**

Jacobs will provide progress reports as part of the Jacobs Monthly Progress Report (MPR).

**2.8 Task 8: Mobile Source Dynamometer Research Laboratory Infrastructure Support**

Jacobs will perform the following subtasks, as the need arises and if sufficient funds allow. This work

## Ex. 4 CBI

**2.8.1 Operational Support**

Jacobs will provide support to assist in the preparation and operation of the dynamometer, analytical bench, CVS system, and (PEMS) in accordance with the CFR and laboratory protocols established by EPA. Variances are permitted only by TD from the WACOR.

It is anticipated that there will be twenty-seven weeks of baseline dynamometer testing in support of facility readiness. Jacobs will provide six weeks of on-road emissions testing to maintain readiness of the portable raw exhaust stack.

This work plan estimate covers the following tests at the listed conditions.

- Sixty-six baseline tests for LDVs. The sequence above will be performed at ambient temperatures of 72 °F (22 °C) and 20 °F (-7 °C).

**2.8.2 Instrument Evaluations and Repairs**

Jacobs will perform instrument/equipment evaluations and repairs as necessary to demonstrate and maintain proper operability and will assist in facility/equipment problem resolution.

**2.8.3 Infrastructure Materials to Supply**

Jacobs will acquire supplies, consumables, and calibration/reference materials needed to assess regulated emissions, particulate matter less than 2.5 micrometers in diameter (PM<sub>2.5</sub>), carbonyls, VOCs, semi-volatile organic compounds (SVOCs), Mobile Source Air Toxics (MSAT), and oxygenates. Gas standards will be procured from Scott Specialty Gasses or a vendor whose compliance with EPA standards has been shown to be statistically equivalent.

**2.8.4 Raw data**

Jacobs will forward the raw data to the WACOR on the day the samples are taken.

**2.8.5 Quality Assurance Forms**

Quality Assurance (QA) forms, provided by the WACOR to Jacobs, will be completed in accordance with WACOR TD. An electronic copy (PDF) will be provided to the WACOR on the day of completion.

**2.8.6 Protocol Prerequisite**

Protocols will be provided to Jacobs by the WACOR prior to initiation of the technical work.

**2.8.7 Infrastructure Sample Custody**

Jacobs will maintain a sample custody log of PM, DNPH, water impingers, passivated canisters, fuels, and bags submitted for sampling and/or received for analyses following sample collection. In the majority of cases, it may be necessary for a number of individual samples from a single source to be composited, thereby necessitating careful recording of the composited samples. The WACOR will notify Jacobs of the analytical method EPA plans to apply prior to analyzing any sample set.

**2.8.8 Waste**

Jacobs will provide for appropriate handling and disposal of all laboratory waste materials, including expired test fuels.

**2.8.9 Instrumentation Support**

Jacobs will support operation, maintenance, modification, and calibration of analytical instrumentation and ancillary equipment in the EPA Mobile Source Emissions Measurement and Characterization (MSEMC) Laboratory. Jacobs will maintain a file of operating manuals for all equipment and instruments.

**2.8.10 Inventory**

Jacobs will maintain a complete and up-to-date inventory for the MSEMC Laboratory along with Safety Data Sheets (SDSs) for all chemicals and gases.

**2.8.11 Infrastructure Periodic Deliverables**

Jacobs will supply to the WACOR the information below at least monthly by completing the QA forms provided by the WACOR.

- List by run number of the dynamometer tests completed
- List by identification number of the samples provided for analyses
- Description of experimental procedure used and any observed anomalous behavior
- List of calibrations completed with the date of each instrument's calibration respectively
- General description of laboratory operations
- Electronic copies of raw data sets

### 2.8.12 Labor Mix

Jacobs will provide the appropriate labor combination to achieve the objectives of the WA including experienced dynamometer, instrumentation, and analysis personnel.

### 2.8.13 Provisions of Spares, Parts, Equipment, and Instruments

Jacobs will provide adequate spares, parts, equipment, and instruments to perform the weekly dynamometer emissions tests.

## 3. Schedule

The project milestones/deliverables for this WA are as follows:

Task	Milestone/Deliverable	Estimated Date
NA	Work plan and cost estimate	4/29/2019
NA	Monthly Progress Report	Ongoing
5	Emissions testing start	TBD upon receiving TD from the WACOR
5	Emissions testing end	Three months after testing begins
8	Infrastructure Support Allocation Interim Report	9/30/2019
8	Infrastructure Support Allocation Report	3/31/2020

## 4. Quality Assurance/Quality Control (QA/QC)

Jacobs will review and comply with the “Mobile Sources Emissions and Characterization” February 2016 QAPP provided by the WACOR. Any exceptions to the QAPP will be conveyed in writing to the WACOR.

## 5. Conflict of Interest Statement

Jacobs certifies that, to the best of our knowledge and belief, all actual or potential organizational conflicts of interest have been reviewed and reported to the Contract-Level Contracting Officer’s Representative, and no actual or potential organizational conflicts of interest exist. In addition, Jacobs certifies that our personnel performing the work under this WA or relating to this WA have been informed of their obligation to report personal and organizational conflicts to their supervisor and/or program manager. Jacobs recognizes the continuing obligation to identify and report any actual or potential conflicts of interest arising during performance of this WA.

## **6. Work Assignment Staffing Plan and Cost Estimate Summary**

Jacobs has performed an analysis of each task in this WA, and a summary of the staffing plan and estimate of cost are provided below. The actual work in each task area will depend on the actual work ordered through technical directive. If EPA's priorities or technical requirements change significantly during the course of the WA, the WACOR will issue a WA amendment or modification. Jacobs will then prepare and submit a modified work plan and/or cost estimate.

# **Ex. 4 CBI**



## MONTHLY PROGRESS REPORT

Research Laboratory Support for the EPA ORD at RTP, NC  
Contract No. EP-C-15-008

### Work Assignment No. 3-034

Mobile Source Emissions Measurement and Characterization

EPA WACOR: **Thomas Long**  
Jacobs WAL: **Craig Williams**  
Reporting Period: **March 2019 (2/23/2019 – 3/29/2019)**  
Period of Performance: **4/1/2018 – 3/31/2019**

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### SUMMARY

The purpose of this U.S. Environmental Protection Agency (EPA) Work Assignment (WA) is to generate emissions data from three vehicles satisfying Office of Transportation and Air Quality requirements for new Motor Vehicle Emission Simulator (MOVES), TBD. Chassis dynamometer driving cycles will consist of one HD-UDDS Test Protocol (<https://www.epa.gov/sites/production/files/2015-10/huddscol.txt>) and three repetitions of a locally developed cycle which is approximately 20 minutes in duration. These driving cycles will be repeated until nine valid (see below) data sets are created for each vehicle. On road measurements with a portable emissions measurement system (PEMS) unit will be made over the road. Each of two routes is expected to be completed in two working days. This will require a total of up to 8 days of on-road testing (including set up and break down days).

### PROGRESS THIS PERIOD

- Received an estimate from Jacobs Risk Manager that the approximate cost to provide insurance on a class 8 truck with a 48' dry van trailer would be about Ex. 4 CBI and informed the EPA Work Assignment Contracting Officer's Representative (WACOR).
- Disposed of 192 gallons old fuel from six existing drums at EPA through Environmental Products and Services. Scanned the manifest and Bill of Lading and sent them to the WACOR.
- Received delivery of 400 gallons of on-road diesel fuel from Couch Oil. Scanned the delivery ticket and emailed to the WACOR.
- Received the Portable Emissions Measurement System (PEMS) after repair, calibration and certification.
- Packaged and shipped two Horiba CPU boards to Horiba Automotive Test Systems in Ann Arbor, MI for re-programming free of charge.
- Contacted Enthalpy and ALS Global to inquire if they can analyze diluted mobile source emissions for Ethylene Oxide (EtO) per method TO-15 "Determination of Volatile Organic Compounds in Air". ALS Global replied that they do not offer the service. Enthalpy offered to discuss some alternate methods. Informed the WACOR.
- Purchasing:
  - Received two heated sample probes, two heated filters, and two temperature controllers from Unique Heated Products.
  - Received ball valves and fittings from Swagelok NC.

- Received four 9 pin D-connectors from Aalborg.
- Received three heat shrink kits from Allied Electronics.
- Received two disc-packs manufactured by Lovejoy Inc and purchased through Motion Industries.
- Purchased and received a pressure transducer from Omega.
- Purchased and received a heater, gas can, oil and funnels from Lowes.
- Purchased six, two each of 3 different kinds, of Guardian Couplings.
- Purchased a replacement part for a Cramer step stool.
- Purchased six gas cylinder wrenches from Matheson Gas.
- Purchased four cables from Aalborg Instruments.
- Submitted the Infrastructure Allocation Support report covering the period from April 2018 through February 2019.

#### **PROGRESS ANTICIPATED NEXT PERIOD**

- None – end of performance period: 3/31/2019.

#### **DIFFICULTIES ENCOUNTERED AND REMEDIAL ACTIONS TAKEN**

- Retained from previous MPR, “The EPA Work Assignment Contracting Officer’s Representative (WACOR) postponed emissions testing due to EPA equipment availability. Testing is expected to begin around January 2019, and WACOR will inform Jacobs of the new dates when available.”

#### **SCHEDULED DELIVERABLES/MILESTONES**

<b>Task</b>	<b>Deliverable/Milestone</b>	<b>Date Due</b>	<b>Status and Date</b>
NA	Work plan and cost estimate for Amendment 0	6/18/2018	Submitted 6/18/2018.
NA	Monthly Progress Report	Ongoing	Ongoing
1	Emissions testing start	TBD by WACOR	
	Emissions testing complete	TBD by WACOR	
	Infrastructure support allocation interim report	10/31/2018	Submitted 10/30/2018 Submitted 2/19/2019
	Infrastructure support allocation report	3/31/2019	submitted through February

#### **QUALITY ASSURANCE ISSUES/STATUS**

Jacobs will review and comply with the Mobile Source Emissions Measurement and Characterization (MSEMC) Quality Assurance Project Plan (QAPP) that will be provided by the WACOR. The contractor will collect and record vehicle information as described in the MSEMC QAPP.

#### **SAFETY INITIATIVES**

All work and procedures were performed under EPA Research Laboratory Support (RLS) Health and Safety Plan (HASP), Chemical Hygiene Plan, and Jacobs Beyond Zero Safety culture. All work was performed in accordance with all project-specific HASPs, job hazard analyses (JHAs), and procedures.

**EQUIPMENT FAILURES**

- None.

**OUTSTANDING ACTIONS AWAITING CONTRACT OFFICER AUTHORIZATION**

- None.



# Ex. 4 CBI



US ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK FINANCIAL MANAGEMENT CENTER  
MAIL CODE MD-32  
RESEARCH TRIANGLE PARK, NC 27711

SF 1035, Labor Hours By Employee, Voucher EPATP-312

Contract Number: EP-C-15-008, Billing Period: 02/23/2019 to 03/29/2019

WA-3-034

**Ex. 4 CBI**

# **Ex. 5 Deliberative Process (DP)**



**PC BUS UNIT:** EPATP

**WA-3-034 Mobile Source Emissions**

**Ex. 4 CBI**



## MONTHLY PROGRESS REPORT

Research Laboratory Support for the EPA ORD at RTP, NC  
Contract No. EP-C-15-008

### Work Assignment No. 4-034

Mobile Source Emissions Measurement and Characterization

EPA WACOR: **Thomas Long**  
Jacobs WAL: **Craig Williams**  
Reporting Period: **September 2019 (8/24/2019 – 9/27/2019)**  
Period of Performance: **4/1/2019 – 3/31/2020**

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### SUMMARY

The purpose of this U.S. Environmental Protection Agency (EPA) Work Assignment (WA) is to generate new emissions data from up to two vehicles satisfying Office of Transportation and Air Quality (OTAQ) requirements for new Motor Vehicle Emission Simulator (MOVES) data. Chassis dynamometer driving cycles will consist of one Heavy-Duty Urban Dynamometer Driving Schedule (HD-UDDS) test protocol (<https://www.epa.gov/sites/production/files/2015-10/huddscol.txt>) and three repetitions of a locally developed cycle which is approximately 20 minutes in duration. These driving cycles will be repeated until nine valid data sets are created for each vehicle. On road measurements with a portable emissions measurement system (PEMS) unit will be made over the road. Each of two routes is expected to be completed in two working days. This will require a total of up to eight days of on-road testing (including set up and break down days).

### PROGRESS THIS PERIOD

- Provided phase 4 sampling support for small-chassis dynamometer testing and ethylene oxide (EtO) sampling support.
- Received Method TO-15, Method 3C, and EtO analyses results from 25 summa canister samples collected during phase 4 testing.
- Submitted purchase orders for phase 5 sampling supplies and analyses to include Method TO-15, Method 3C, and EtO. Received notification from the EPA Work Assignment Contracting Officer's Representative (WACOR) that phase 5 testing is delayed and to not schedule delivery/pick up of supplies until technical direction is received.
- Completed impinger sample analyses for methanol and ethanol and submitted the updated composite spreadsheet to the WACOR.
- Received a quote and purchased the following:
  - Carrier demodulator (electronics that support a variable reluctance pressure transducer).
  - Digital smart manometer.
  - High temperature pump for a California Analytical Instruments (CAI) model 600 heated chemiluminescent detector (HCLD).
  - Filament for model 5973 gas chromatograph / mass spectrometer (GC/MS).
  - Replacement variable frequency drive (VFD).
  - Six brass gas cylinder regulators (2 CGA 580, 2 CGA 590, 2 CGA 350).

- Purchased and received the following:
  - Three 55-gallon drums of EPA Tier 3 EEE emission certified fuel.
  - 200 feet each of 1/4" and 3/8" outside diameter (OD) Teflon tubing.
  - Miscellaneous tube fittings.
  - Mini data loggers with global positioning systems (GPS) that acquire bus data from vehicles and software.
  - Detector and sample cell for an ABB URAS 14 Non-Dispersive Infrared Detector (NDIR) analyzer.
  - Two packages of O-rings.
- Received a quote for three dual stage filter holders and nine single stage filter holders, all stainless steel. Currently waiting for direction from the WACOR to proceed with purchasing.
- Submitted a purchase order with a quote, and a return material authorization (RMA) number for calibration of a Meriam laminar flow element (LFE). Shipped the LFE to Meriam for cleaning and calibration.
- Submitted a purchase order, quote, and sole source justification for CAI model 700 HCLD nitric oxide (NO)/oxides of nitrogen (NO<sub>x</sub>) analyzer.
- Received a quote for replacing the system B compressor in room E180. Submitted a purchase order, quote and sole source justification for the system B compressor.
- Received the repaired CAI model 600 heated flame ionization detector (HFID) analyzer from the manufacturer, serial number R06028.
- Completed and submitted a return authorization form to return three exhaust flow meters to Sensors Inc. for calibration, serial numbers: H13110123, E18507275, and E18507276.

#### **PROGRESS ANTICIPATED NEXT PERIOD**

- Prepare for phase 5 sampling support for testing on the heavy-duty chassis dynamometer.
- Replace light-duty chassis dynamometer system B compressor.
- Submit purchase requisition for Sensors Inc. exhaust flow meter calibrations.
- Initiate fabrication of a mounting plate for the small-engine dynamometer and mounting plates for small test engines.
- Submit infrastructure support allocation report.

#### **DIFFICULTIES ENCOUNTERED AND REMEDIAL ACTIONS TAKEN**

- None.

#### **SCHEDULED DELIVERABLES/MILESTONES**

Task	Deliverable/Milestone	Date Due	Status and Date
NA	Work plan and cost estimate, Amendment 1	4/29/2019	Submitted
NA	Work plan and cost estimate, Amendment 2	7/31/2019	Submitted 7/30/2019
NA	Monthly Progress Report	Ongoing	Ongoing
5	Emissions testing start	TBD upon receiving TD from the WACOR	

Task	Deliverable/Milestone	Date Due	Status and Date
5	Emissions testing end	Three months after testing begins	
8	Infrastructure support allocation interim report	9/30/2019	
8	Infrastructure support allocation report	3/31/2020	

**QUALITY ASSURANCE ISSUES/STATUS**

Jacobs will review and comply with the Quality Assurance Project Plan (QAPP), "Mobile Sources Emissions and Characterization," dated February 2016, provided by the WACOR. Any exceptions to the QAPP will be conveyed in writing to the WACOR.

**SAFETY INITIATIVES**

All work and procedures were performed under the EPA Research Laboratory Support (RLS) Health and Safety Plan (HASP), Chemical Hygiene Plan, and Jacobs Beyond Zero Safety culture. All work was performed in accordance with all project-specific HASPs, job hazard analyses (JHAs), and procedures.

**EQUIPMENT FAILURES**

- None

**OUTSTANDING ACTIONS AWAITING CONTRACT OFFICER AUTHORIZATION**

- None.

# Ex. 4 CBI





US ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK FINANCIAL MANAGEMENT CENTER  
MAIL CODE MD-32  
RESEARCH TRIANGLE PARK, NC 27711

SF 1035, Labor Hours By Employee, Voucher EPATP-406

Contract Number: EP-C-15-008, Billing Period: 08/24/2019 to 09/27/2019

WA-4-034

# Ex. 4 CBI

# Ex. 4 CBI

# Ex. 4 CBI

# Ex. 4 CBI

## Message

**From:** Laroo, Chris [laroo.chris@epa.gov]  
**Sent:** 10/16/2019 2:30:21 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: Missing Data Request - F750 and Caravan EtO Testing

Tom,

Thanks. I didn't see this before our call today. Per the e-mail that trailed this first one I sent, I do still need the caravan bag 2 emission results including Vmix and miles, as well as the Vmix and miles for the   test.

Thanks again for sending this along as it will allow me to make progress on my emission analysis.

Regards,

Chris Laroo  
 Environmental Protection Specialist  
 US Environmental Protection Agency  
 Office of Transportation and Air Quality  
 Assessment and Standards Division  
 2000 Traverwood Dr.  
 Ann Arbor, MI 48105  
 (734) 214-4937  
 (734) 214-4055 (fax)  
 Email: laroo.chris@epa.gov

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**From:** Long, Thomas <Long.Thomas@epa.gov>  
**Sent:** Wednesday, October 16, 2019 8:48 AM  
**To:** Laroo, Chris <laroo.chris@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: Missing Data Request - F750 and Caravan EtO Testing

Caravan data with vmix and miles attached.

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

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**From:** Laroo, Chris <laroo.chris@epa.gov>  
**Sent:** Tuesday, October 08, 2019 2:31 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** Missing Data Request - Ex. 5 Deliberative Process (DP) esting

Tom,

I am missing two pieces of data to enable some analysis that we want to perform on the test results. Could you please send me the CVS vmix values and the miles driven for each of the **Ex. 5 Deliberative Process (DP)** tests. The results that you sent us does not include those values. Thanks.

Regards,

Chris Laroo  
Environmental Protection Specialist  
US Environmental Protection Agency  
Office of Transportation and Air Quality  
Assessment and Standards Division  
2000 Traverwood Dr.  
Ann Arbor, MI 48105  
(734) 214-4937  
(734) 214-4055 (fax)  
Email: laroo.chris@epa.gov

## Message

**From:** Snow, Richard [Snow.Richard@epa.gov]  
**Sent:** 10/2/2019 1:35:53 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**Subject:** RE: Proposal

James wants cans analyzed for ethylene too.

---

**From:** Long, Thomas <Long.Thomas@epa.gov>  
**Sent:** Wednesday, October 02, 2019 9:30 AM  
**To:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** Proposal

Vehicle: Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) I-6 6.7L, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule:

Transient 3 Warm-up

20 minute soak

Transient 3

20 minute soak

HD-UDDS (1060 second, 5.5 miles)

25 minute soak (to allow for reading bags)

Steady acceleration to 60 mph and hold for six minutes. Sample for the last 5 minutes at steady state. Stop sampling as the vehicle decelerates to 0 and turns off.

SUMMA cans for EtO and TO-15 analyses will be collected at three locations: pre-SCR, post-DPF, and dilution tunnel. A background can will be collected in the test bay during the HD-UDDS.

Total Cans Round 5 –

3 source cans per cycle, 3 days with 3 cycles, 27 source cans

1 ambient can per test day, 3 ambient cans

1 blank

1 spiked steady state on each of two days, 2 spiked cans

3 controllers at 315 seconds (for Trans3)

4 controllers at 1060 seconds (for HD-UDDS and ambient background)

5 controllers at 600 seconds (for steady state samples and spiked samples)

.

Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide. Samples will be collected into batch blank checked Silco/Silonite lined sampling canisters (volume TBD). Samples will be returned to Enthalpy's lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360

109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944





**Jacobs Technology Inc. EPA RLS Support**

**WA 4-034: Mobile Source Emissions and Characterization**

**Work Plan**

Contract Number: **EP-C-15-008**  
Work Assignment (WA) Number: **4-034** Amendment: **2**  
WA Leader: **Craig Williams**  
WA Contracting Officer's Representative: **Thomas Long**  
Period of Performance: **4/1/2019 to 3/31/2020**

Work Plan Due Date: **4/29/2019**  
Work Plan Submission Date: **4/26/2018**  
Amendment 2 Due Date: **7/31/2019**  
Amendment 2 Submission Date: **7/31/2019**

## **1. Overview**

This Work Assignment (WA) will provide support to the U.S. Environmental Protection Agency (EPA), and is in response to Amendment 2 to the original Performance Work Statement (PWS). Amendment 2 adds scope to include additional ethylene oxide (EtO) sampling and analyses for five more tests and increases the scope of work in Task 4 to provide a second test vehicle.

### **1.1 Summary of Objectives**

EPA's Motor Vehicle Emissions Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria air pollutants, greenhouse gases, and air toxics. This project will generate emissions data from up to three vehicles that satisfy the Office of Transportation and Air Quality (OTAQ) requirements for new MOVES data. Chassis dynamometer driving cycles will consist of one Heavy-Duty Urban Dynamometer Driving Schedule (HD-UDDS) test protocol (<https://www.epa.gov/sites/production/files/2015-10/huddscol.txt>) and three repetitions of a locally developed driving cycle which is approximately 20 minutes in duration. The objective is to generate and sample emissions data that will be included in an already existing database with the expectation to provide insight into whether it is necessary to modify MOVES to improve emissions factors or to fill similar gaps in represented emission factors.

## **2. Technical Approach**

The project has been designed to fill data gaps or improve existing emission factors for the case of heavy-duty trucks (HDT), medium heavy-duty trucks (MHDT), or gas direct injection (GDI) vehicles.

- Chassis dynamometer testing will be conducted on up to three heavy-duty vehicles (HDVs) tested at an ambient temperature of 70 °F.
- Chassis dynamometer test cycles will include various operating phases; a cold start California Air Resources Board (CARB) transient cycle, a warm start HD-UDDS, two World Harmonized Vehicle Cycles (WHVC), and three warm start Mobile Source Distributed Power Driving Schedules (MSDPDS) designed to generate data in each of the modes represented in the MOVES model.
- Core dynamometer bench measurements will include total hydrocarbon (THC), non-methane hydrocarbons (NMHC), non-methane organic gas (NMOG), oxides of nitrogen (NO<sub>x</sub>), nitrogen dioxide (NO<sub>2</sub>), carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), and particulate matter (PM).
- Chassis dynamometer testing will generate speciated volatile organic compound (VOC) data.

**2.1 Task 1: (Reserved by Work Assignment Contracting Officer's Representative [WACOR])****2.2 Task 2: (Reserved by the WACOR)****2.3 Task 3: Test Fuels and Lubrication**

Jacobs provided 400 gallons of on-road diesel fuel from a single batch during the preceding option period under WA 3-034 as directed by the EPA WACOR. Jacobs has included funds in this budget estimate to purchase 100 gallons of non-ethanol gasoline and does not anticipate a need to buy more fuel. If the WACOR provides a technical directive (TD) to purchase more fuel, Jacobs will assist the WACOR in locating and purchasing the fuel specified if funding is available at that time. If additional funding is required, a revised budget will be submitted. Jacobs will procure services with a laboratory for providing analyses of the fuels before and after testing. This work plan estimate includes funds for 10 fuel and lubricant samples. Jacobs will purchase additional analyses if sufficient funds allow.

**2.4 Task 4: Vehicle Procurement and Preparation**

Through conversations with the WACOR, EPA currently intends to perform many tasks associated with vehicle procurement and preparation. Technical direction to perform these tasks may require submission of a revised work plan estimate.

Jacobs initiated a search during the last option period under WA-3-034 to locate a test vehicle for leasing based on specifications provided by the WACOR and will continue the effort under this WA after receiving notification from the WACOR that the dynamometer repairs by EPA are complete and the dynamometer is ready for testing. The lease will span the duration from test preparation to on-road testing by EPA personnel. The lease period is expected to last 11-weeks total. Jacobs will supply an insurance certificate for liability and physical damage. Jacobs will provide emissions sampling support to test a second vehicle if TD is received by the WACOR. The second vehicle, if tested, will be provided by EPA.

Amendment 2 to this work plan budget estimate includes a one-month lease for a second vehicle to be specified by the WACOR but expected to be similar to a **Ex. 4 CBI** gasoline truck. Jacobs will supply sampling support for testing this vehicle and insurance for liability and physical damage to the vehicle.

Jacobs will perform a thorough inspection before beginning the test preparation sequence. This includes inspection and documentation of the engine, transmission, axles, exhaust system and tires, and documentation of the engine control module (ECM) status, if available, on that vehicle. Jacobs will prepare titled photographs of the vehicle exhaust systems, engine plates, and emissions plates and will include them as part of the infrastructure support allocation progress and final reports. Photographs of the vehicle mounted to the chassis dynamometer will also be included. Jacobs will collect and record vehicle information as described in the Quality Assurance Project Plan (QAPP).

Jacobs will assist with the performance of on-road coast-down tests pending contract officer approval.

**Ex. 4 CBI**

Jacobs will perform initial crankcase, oil filter, and air filter replacement. Oil and air filters will be procured by Jacobs according to manufacturer recommendations. Engine oil recommended in the owner's manual of each vehicle will be used. Jacobs will purchase the recommended grade of lubricant.

After the last test of each vehicle in the program, Jacobs will record the lubricant level indicated on the dipstick before collecting a 0.25-quart of oil for sample analysis (lubricant testing in Task 3).

If any of the vehicles are equipped with traction control, Jacobs will ensure that the traction control is disabled either through an interior disable button or other method (i.e., remove power fuse to anti-lock braking system (ABS)), and place a placard in the vehicle indicating the method of disabling the traction control if driver input is required.

Jacobs will be provided target road load coefficients by the WACOR and set load coefficients for the test vehicles according to 40 Code of Federal Regulations (CFR) 1066.301 and 40 CFR 1066.310 (or Jacobs will propose and use an alternate method, subject to approval by EPA). For the purpose of this study, the agreed road load setting method will remain the same for all testing on a given vehicle.

Jacobs will provide hardware and software for reading and archiving vehicle ECM data during testing.

## **Ex. 4 CBI**

If additional hardware or software is required, then a revised budget may be needed. Additionally, if purchasing and receiving additional equipment or software causes a delay in the capability of acquiring ECM data for the tests, then a revised test and deliverables schedule may be needed.

### **2.5 Task 5: Vehicle Testing**

#### **2.5.1 Basic Testing Protocol**

Through conversations with the WACOR, EPA intends to perform many tasks associated with vehicle testing. Technical direction to perform these tasks may require submission of a revised work plan estimate.

Jacobs will provide support for dynamometer testing, for both Light Duty Vehicles (LDVs) and HDVs, following a protocol that includes various operating phases. The LDV and HDV protocols begin with a cold start CARB transient cycle, a HD-UDDS, two WHVC, and three warm start MSDPDS. Jacobs will provide support for Light duty vehicle testing in compliance with CFR Part 86, Subpart C, CFR Part 1065, and CFR part 1066. For MHDT and HDT, the HD-UDDS will be conducted in compliance with CFR Part 86 Subpart N, and CFR Part 1065 (No MHDT testing is expected to occur during this period of performance).

This work plan estimate covers the following tests at the listed conditions. The WACOR will define the duration subsets of the driving cycles for each test for Jacobs to provide sampling support. Note that all LDV testing will be conducted under Task 8.

Seventeen project tests (including two repeat tests) for up to three HDVs, two provided by Jacobs, the second provided by EPA. The sequence above will be performed in both laden (six tests) and unladen (six tests) conditions, at an ambient temperature of 70 °F (20 °C).

HDV tests will be performed on the 72-inch, single-roll electric heavy-duty chassis dynamometer. Jacobs will provide one person with test experience to provide technical support during sampling and general set up and tear down. LDV test will be performed on the 48-inch, single-roll light-duty chassis dynamometer. It is anticipated that EPA will provide the same driver to be used for all tests on a given vehicle.

Funding has been included in the estimate to support conducting the measurements below and to provide the consumables for sampling. Jacobs will support performing the following.

- Measure and report gaseous emissions for THC, methane (CH<sub>4</sub>), NO<sub>x</sub>, NO<sub>2</sub>, CO, and CO<sub>2</sub> as specified in 40 CFR Part 1065. EPA will provide an operational system for measuring these gaseous emissions including an NO<sub>2</sub> analyzer with a minimum detection limit of 5ppb.
- collect samples using cleaned SUMMA canisters, provided by EPA, from which the US EPA will speciate VOCs.
- Use EPA provided instrumentation to analyze for speciated oxygenates as per CARB 1001. This work

#### **Ex. 4 CBI**

- Provide polyurethane foam (PUF) sorbent plugs or their equivalent as approved by the WACOR and collect samples on which EPA will conduct analyses.
- Provide Teflon filters for EPA to collect samples and perform gravimetric analyses.
- Provide quartz filters on which EPA will conduct chemical analyses.
- Provide 2,4-dinitrophenylhydrazine (DNPH) cartridges and collect samples on which EPA will conduct carbonyl analyses.

During all emissions tests, Jacobs will record the following ECM parameters if available for the vehicle at a rate of 1 Hz. Jacobs will supply and/or procure the data acquisition equipment.

- RPM
- Vehicle speed
- Engine load
- MIL status
- Absolute throttle position
- Engine coolant temperature
- Short-term fuel trim-bank 2
- Long term fuel trim-bank 2
- Fuel/air commanded equivalence ratio
- Alcohol fuel present
- Manifold absolute pressure

- Spark advance
- Proportional-Integral-Derivative (PID) control module voltage
- Air flow rate from mass air flow sensor

Jacobs will assist in maintaining the facilities for testing in conformance with the requirements of 40 CFR Part 86 Subparts C and N and 40 CFR Part 1066 as they apply to vehicle emissions testing. If some aspect of the testing needs to be performed in variance to the above specifications, Jacobs will describe why that is the case and how it may impact the test results. Variances will be approved by the WACOR before testing begins.

Jacobs will monitor the tunnel flow to ensure that it remains constant during the test. The constant volume sampling (CVS) blower will be kept on for one-half hour before the first emission test on a given day and continuously between emission tests to ensure tunnel stability.

Jacobs will provide and maintain cooling fan placement and air flow for each test vehicle on all tests. The flow of air sweeping the vehicle in the test cell will be consistent between tests.

Jacobs will perform “blank” tests at a maximum of one-month intervals or when test conditions change during the program. These tests will involve running the fuel test sequence drawing only background air into the sampling system. All sampling systems will be operated, and measurements will include the following.

- Operating-Phase level THC, CH<sub>4</sub>, NO<sub>x</sub>, NO<sub>2</sub>, CO, and CO<sub>2</sub>, PM, and VOCs (including alcohols and carbonyls)
- Continuous THC, CH<sub>4</sub>, NO<sub>x</sub>, CO, and CO<sub>2</sub>

Jacobs will provide a technician to support up to 21 days of portable emissions measurement systems (PEMS) testing and up to 110 days of chassis dynamometer testing.

### **2.5.2 Speciation of Volatile Organic Compounds, Dynamometer Tests**

Jacobs will perform sampling and analyses of alcohols using CARB Method 1001, “Determination of Alcohols in Automotive Source Samples by Gas Chromatography,” as modified by the miscellaneous operating procedure (MOP) included in the QAPP.

Sampling and analyses of carbonyl compounds will be performed using TO-11a “Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC).” Carbonyl sampling will be performed by Jacobs. Carbonyl analyses will be performed by EPA.

Jacobs will seal and store alcohol samples at a temperature below 40 °F immediately following collection. Jacobs will make every effort to analyze these samples on the day they are collected but no later than six calendar days.

As part of Amendment 1 to the original PWS, Jacobs will provide EPA Method TO-15 analyses including ethylene oxide (EtO) for up to 23 sample canisters in accordance with the QAPP. As part of Amendment 2 to the PWS Jacobs will provide TO-15 analysis including EtO for up to 101 sample canisters.

Jacobs will test no more than one vehicle per test day on the chassis dynamometer, unless Jacobs can demonstrate that the total number of vehicles tested on that day and the timing of their tests will not compromise the time limit requirements imposed on sample analyses.

### **2.5.3 (Reserved by the WACOR)**

### **2.5.4 PM Measurements and Analyses**

EPA will collect PM on a Teflon filter for mass determination and on a quartz filter for mass determination and subsequent chemical analyses for tests on the chassis dynamometer. Jacobs will assist EPA with the sampling method to collect sufficient sample for chemical analyses. PM mass will be measured as specified in 40 CFR 1065. Two parallel filters will collect samples for each operating phase. Testing will be conducted by collecting PM samples in parallel. One filter will be at the certification filter face velocity of 100 cm/s and the other will be set to alternate speeds as specified by OTAQ. Other deviations from this method will require approval from the WACOR.

## **2.6 Task 6: Coordination and Support of Non-Regulated Emissions Measurements**

### **2.6.1 UV-DOAS instrument (Reserved by the WACOR)**

### **2.6.2 Fourier Transform Infrared**

Jacobs will coordinate with Edgar Thompson, or his delegate, to conduct Fourier transform infrared (FTIR) measurements from a probe in the dilution tunnel.

### **2.6.3 Polycyclic Aromatic Hydrocarbons**

Jacobs will coordinate with Michael Hays, or his delegate, to provide sufficient media to sample polycyclic aromatic hydrocarbons (PAHs) for three of the five operating phases per test. This will include use of alternate absorbents to PUF or an equivalent method to be approved by the WACOR.

### **2.6.4 Volatile Organic Compounds**

Jacobs will coordinate with the WACOR or designee to use sufficient, clean and prepared SUMMA canisters for VOC analyses for all five operating phases per test.

### **2.6.5 Metals**

Jacobs will coordinate with Michael Hays, or his delegate, to provide sufficient media for metals analyses on two of the five operating phases per test if the WACOR requests and sufficient funds allow. Based on conversations with the WACOR there will be no metals analyses on this project.

## **2.7 Task 7: Deliverables**

### **2.7.1 Work Plan**

Jacobs will submit a work plan for this WA.

### **2.7.2 Infrastructure Support Allocation Report**

Jacobs will provide an interim and final infrastructure report detailing the level-of-effort hours and direct costs expended to support Task 8. Each report will not exceed one-page of narrative and will provide a brief statement of what was accomplished.

### **2.7.3 (Reserved by the WACOR)**

### **2.7.4 Monthly Reports**

Jacobs will provide progress reports as part of the Jacobs Monthly Progress Report (MPR).

## **2.8 Task 8: Mobile Source Dynamometer Research Laboratory Infrastructure Support**

Jacobs will perform the following subtasks, as the need arises and if sufficient funds allow. This work plan estimate includes **Ex. 4 CBI** for direct costs associated with purchasing and repairs in the subtasks below.

### **2.8.1 Operational Support**

Jacobs will provide support to assist in the preparation and operation of the dynamometer, analytical bench, CVS system, and (PEMS) in accordance with the CFR and laboratory protocols established by EPA. Variances are permitted only by TD from the WACOR.

It is anticipated that there will be twenty-seven weeks of baseline dynamometer testing in support of facility readiness. Jacobs will provide six weeks of on-road emissions testing to maintain readiness of the portable raw exhaust stack.

This work plan estimate covers the following tests at the listed conditions.

- Sixty-six baseline tests for LDVs. The sequence above will be performed at ambient temperatures of 72 °F (22 °C) and 20 °F (-7 °C).

### **2.8.2 Instrument Evaluations and Repairs**

Jacobs will perform instrument/equipment evaluations and repairs as necessary to demonstrate and maintain proper operability and will assist in facility/equipment problem resolution.

### **2.8.3 Infrastructure Materials to Supply**

Jacobs will acquire supplies, consumables, and calibration/reference materials needed to assess regulated emissions, particulate matter less than 2.5 micrometers in diameter (PM<sub>2.5</sub>), carbonyls, VOCs, semi-volatile organic compounds (SVOCs), Mobile Source Air Toxics (MSAT), and oxygenates. Gas standards



will be procured from Scott Specialty Gasses or a vendor whose compliance with EPA standards has been shown to be statistically equivalent.

#### **2.8.4 Raw data**

Jacobs will forward the raw data to the WACOR on the day the samples are taken.

#### **2.8.5 Quality Assurance Forms**

Quality Assurance (QA) forms, provided by the WACOR to Jacobs, will be completed in accordance with WACOR TD. An electronic copy (PDF) will be provided to the WACOR on the day of completion.

#### **2.8.6 Protocol Prerequisite**

Protocols will be provided to Jacobs by the WACOR prior to initiation of the technical work.

#### **2.8.7 Infrastructure Sample Custody**

Jacobs will maintain a sample custody log of PM, DNPH, water impingers, passivated canisters, fuels, and bags submitted for sampling and/or received for analyses following sample collection. In the majority of cases, it may be necessary for a number of individual samples from a single source to be composited, thereby necessitating careful recording of the composited samples. The WACOR will notify Jacobs of the analytical method EPA plans to apply prior to analyzing any sample set.

#### **2.8.8 Waste**

Jacobs will provide for appropriate handling and disposal of all laboratory waste materials, including expired test fuels.

#### **2.8.9 Instrumentation Support**

Jacobs will support operation, maintenance, modification, and calibration of analytical instrumentation and ancillary equipment in the EPA Mobile Source Emissions Measurement and Characterization (MSEMC) Laboratory. Jacobs will maintain a file of operating manuals for all equipment and instruments.

#### **2.8.10 Inventory**

Jacobs will maintain a complete and up-to-date inventory for the MSEMC Laboratory along with Safety Data Sheets (SDSs) for all chemicals and gases.

#### **2.8.11 Infrastructure Periodic Deliverables**

Jacobs will supply to the WACOR the information below at least monthly by completing the QA forms provided by the WACOR.

- List by run number of the dynamometer tests completed
- List by identification number of the samples provided for analyses

- Description of experimental procedure used and any observed anomalous behavior
- List of calibrations completed with the date of each instrument's calibration respectively
- General description of laboratory operations
- Electronic copies of raw data sets

### 2.8.12 Labor Mix

Jacobs will provide the appropriate labor combination to achieve the objectives of the WA including experienced dynamometer, instrumentation, and analysis personnel.

### 2.8.13 Provisions of Spares, Parts, Equipment, and Instruments

Jacobs will provide adequate spares, parts, equipment, and instruments to perform the weekly dynamometer emissions tests.

## 3. Schedule

The project milestones/deliverables for this WA are as follows:

Task	Milestone/Deliverable	Estimated Date
NA	Work plan and cost estimate, Amendment 1	4/29/2019
NA	Work plan and cost estimate, Amendment 2	7/31/2019
NA	Monthly Progress Report	Ongoing
5	Emissions testing start	TBD upon receiving TD from the WACOR
5	Emissions testing end	Three months after testing begins
8	Infrastructure Support Allocation Interim Report	9/30/2019
8	Infrastructure Support Allocation Report	3/31/2020

## 4. Quality Assurance/Quality Control (QA/QC)

Jacobs will review and comply with the "Mobile Sources Emissions and Characterization" February 2016 QAPP provided by the WACOR. Any exceptions to the QAPP will be conveyed in writing to the WACOR.

## 5. Conflict of Interest Statement

Jacobs certifies that, to the best of our knowledge and belief, all actual or potential organizational conflicts of interest have been reviewed and reported to the Contract-Level Contracting Officer's Representative, and no actual or potential organizational conflicts of interest exist. In addition, Jacobs certifies that our personnel performing the work under this WA or relating to this WA have been

informed of their obligation to report personal and organizational conflicts to their supervisor and/or program manager. Jacobs recognizes the continuing obligation to identify and report any actual or potential conflicts of interest arising during performance of this WA.

## **6. Work Assignment Staffing Plan and Cost Estimate Summary**

Jacobs has performed an analysis of each task in this WA, and a summary of the staffing plan and estimate of cost are provided below. The actual work in each task area will depend on the actual work ordered through technical directive. If EPA's priorities or technical requirements change significantly during the course of the WA, the WACOR will issue a WA amendment or modification. Jacobs will then prepare and submit a modified work plan and/or cost estimate.

**WA-4-034**

**Ex. 4 CBI**

## Message

**From:** Shores, Richard [Shores.Richard@epa.gov]  
**Sent:** 8/1/2019 3:27:04 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**Subject:** FW: Additional questions for Ethalpy

Tom,  
 The EtO analysis appears to be problematic at best and there needs to be a meeting with Enthalpy for the benefit of RTP results. The meetings with OTAQ yesterday were difficult because there are so many questions about the validity of the data being generated. Lot of discussion about adding additional cans but even the analysis of the cans completed are in question. Marion wants to repeat the [REDACTED] with cert fuel, Libby wants to add additional spiked cans with air and/or exhaust gas dilutions. The elemental analysis are being called into question by everyone. Are you comfortable with letting Peter set up a meeting with Enthalpy to discuss the analysis techniques? Those wanting to attend this meeting include Libby, Doris, Ingrid and Peter. If you are comfortable letting Peter organize this meeting, send him an email. This really need to happen soon. Thanks Richard

---

**From:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Sent:** Thursday, August 01, 2019 10:36 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Rosati, Jacky <Rosati.Jacky@epa.gov>  
**Subject:** RE: Additional questions for Ethalpy

Marion,

I'm not going to setup the meeting with Enthalpy quite yet with the whole team. These are questions that I am going to need to see them in person and in their lab to answer. I think I will be able to answer all the questions after a discussion with them. I taking Ingrid, Doris, and Libby hopefully next week. We still need to look at the phase 3 results some more before we can really understand what the story is. This is something that Tom needs to setup since this is his project. I will keep you and Kat in the loop on the outcome of the meeting.

Thanks,

Peter

---

**From:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Sent:** Thursday, August 01, 2019 10:10 AM  
**To:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Subject:** RE: Additional questions for Ethalpy

Hey Peter, when you put the agenda together for the meeting with Enthalpy, you could list the agenda item for Chucks questions below under "Canister Pressurization data, Sample Flowrate, and Proportionality"

Cheers,  
 Marion

---

**From:** Hoyer, Marion  
**Sent:** Thursday, August 01, 2019 7:36 AM  
**To:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Cc:** Walters, Charles <walters.charles@epa.gov>  
**Subject:** Additional questions for Ethalpy

Hi Peter,

Chuck's questions are below, highlighted in yellow.

Thanks so much for setting up the meeting with Enthalpy!

Marion

---

**From:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Sent:** Friday, July 26, 2019 1:10 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Cc:** Walters, Charles <[walters.charles@epa.gov](mailto:walters.charles@epa.gov)>; Fernandez, Antonio <[fernandez.antonio@epa.gov](mailto:fernandez.antonio@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>  
**Subject:** RE: [Ex. 4 CBI] data review

Most of those questions will need to be posed to Enthalpy, but the can flow controllers were:

505 seconds ~ 670 ml/min  
 1372 seconds ~ 180 ml/min  
 1060 seconds ~ 180 ml/min

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

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**From:** Hoyer, Marion  
**Sent:** Friday, July 26, 2019 11:58 AM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Walters, Charles <[walters.charles@epa.gov](mailto:walters.charles@epa.gov)>; Fernandez, Antonio <[fernandez.antonio@epa.gov](mailto:fernandez.antonio@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>  
**Subject:** FW: F750 data review

Hi Tom,

Here are the questions Chuck has. Thanks for letting us know your thoughts.

Marion

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**From:** Walters, Charles  
**Sent:** Thursday, July 25, 2019 10:54 AM  
**To:** Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>; Fernandez, Antonio <[fernandez.antonio@epa.gov](mailto:fernandez.antonio@epa.gov)>  
**Subject:** [Ex. 4 CBI] data review

All,

I reviewed the dyno data and Enthalpy report for the [REDACTED]. Since there are concerns with the EtO analysis; I only focused on canister sample collection and CO2 agreement. Here are my observations.

- The uncorrected bag CO<sub>2</sub> vs canister CO<sub>2</sub> agreed within 3% (see yellow areas in spreadsheet). This is significantly better than the [ ] testing. I noticed that the vacuum decay in the canister was considerably smaller than the testing done on the [ ]. The [ ] final Pratio averaged 0.549; which is very near the 0.528 theoretical choked flow Pratio limit for an orifice. This would result in a more constant sample flow over the test phase providing a more representative sample over the phase. This could explain the better CO<sub>2</sub> agreement in the [ Ex. 5 Deliberative Process (DP) ] sting.
- Enthalpy presented the canister pressurization data differently for the [ Ex. 5 Deliberative Process (DP) ]. It would be helpful if the data presentation was consistent. Specifically, the [ ] report provided controller flow data for “initial flow” and “return flow” whereas the [ ] report did not. I assume the “return flow” is the flowrate recorded at the end of sample canister vacuum using an inert gas. This data is very helpful in determining final flow rate as a function of vacuum decay over the sample phase. The [ ] flow data shows initial vs return flow to be very similar (as expected due to the ending Pratio very near the theoretical limit of 0.528 as discussed above). It would be nice to have this data for the [ ] and any future testing.

### Proposed questions to Enthalpy and/or ORD

Below are proposed questions to Enthalpy. These questions are designed to get a better understanding of the before and after state of the sample flow and perhaps influence the controller flow selected for the sample period. I know that this method is still considered qualitative; however, if it transitions to quantitative we will need a better handle on the sample flow and proportionality. I'm not sure if now is the right time to be asking these questions nor do I have a read on cost impacts in asking these questions. We should discuss.

- Is “initial flow” vs “return flow” available for the F150 (similar to the data presented on page 89 of the [ Ex. 5 Deliberative Process (DP) ] report)?
- Can the “initial flow” vs “return flow” data be included in the report for any future testing?
- Is “return flow” measured at the “as received” canister vacuum?
- What nominal flow rate is selected for each sample period? 505s, 1372s, 1060s
- What nominal flow rate options are available?

Thanks,  
Chuck

## Message

**From:** Shores, Richard [Shores.Richard@epa.gov]  
**Sent:** 6/14/2019 1:20:43 PM  
**To:** Groff, Paul [groff.paul@epa.gov]  
**CC:** Long, Thomas [Long.Thomas@epa.gov]; George, Ingrid [George.Ingrid@epa.gov]; Hays, Michael [Hays.Michael@epa.gov]  
**Subject:** Fwd: Funds to NRMRL for EtO

Paul, See below funding from OTAQ and Marion is telling me that it is all expiring! The [redacted] is going to Jacobs to purchase a GC as fast as possible and the rest of the \$ should be spent by Tom this FY. Thanks, R

Sent from my iPhone

Begin forwarded message:

**From:** "Hoyer, Marion" <hoyer.marion@epa.gov>  
**Date:** June 14, 2019 at 7:19:03 AM EDT  
**To:** "Cook, Rich" <Cook.Rich@epa.gov>, "Shores, Richard" <Shores.Richard@epa.gov>, "Long, Thomas" <Long.Thomas@epa.gov>  
**Cc:** "Hays, Michael" <Hays.Michael@epa.gov>  
**Subject:** Funds to NRMRL for EtO

Hi There,

I'm going to try to capture where we are with funding and where we need to be through the end of FY19.

Overall, it sounds like the total for the dyno research, EtO analysis, canisters and the GC-MS, the total is [redacted]

- Rich initiated a PR in April for [redacted] not sure on status, it is taking forever for this to show up on your books☹)
- Rich initiated a second PR in May for [redacted] after the positive finding in the F150. Rich – can you check on the status of that 200K?
- Our FCO was working yesterday on getting the [redacted] for the GC-MS transferred.

If those three things have happened, then we need to get you [redacted] between now and the end of September. Is that all correct?

Thanks!  
 Marion



Message

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**From:** Kariher, Peter [Kariher.Peter@epa.gov]  
**Sent:** 7/26/2019 6:54:43 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Snow, Richard [Snow.Richard@epa.gov]  
**Subject:** RE: Spiked EtO cans

This sounds reasonable. I will have Libby take a look also. Sure makes things look better.

Thanks,

Peter

---

**From:** Long, Thomas  
**Sent:** Friday, July 26, 2019 2:19 PM  
**To:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>  
**Subject:** FW: Spiked EtO cans

Peter,

I have been working feverishly since our telecon to review the impact of a difference in can volume. Please find the calculations I carefully put together in this spreadsheet. Snow had absolutely nothing to do with this. It was all me. (Please ignore the email chain below.)

Seriously, if you see where there is a better way of looking at this please let us know. Thanks.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Snow, Richard  
**Sent:** Friday, July 26, 2019 1:30 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Subject:** RE: Spiked EtO cans

Just a volume correction

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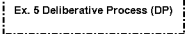
**From:** Long, Thomas  
**Sent:** Friday, July 26, 2019 1:26 PM  
**To:** Snow, Richard <[Snow.Richard@epa.gov](mailto:Snow.Richard@epa.gov)>  
**Subject:** RE: Spiked EtO cans

Your calculations didn't come through with the email.

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Snow, Richard  
**Sent:** Friday, July 26, 2019 1:25 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>; Faircloth, James <[Faircloth.James@epa.gov](mailto:Faircloth.James@epa.gov)>  
**Cc:** Kariher, Peter <[Kariher.Peter@epa.gov](mailto:Kariher.Peter@epa.gov)>  
**Subject:** Spiked EtO cans

Based on the EtO discussion this morning, james and I come up with recalculated recoveries of 77% and 129% on the  
 cans, respectively.

**Richard Snow** | Engineering Technician  
U.S. Environmental Protection Agency/ORD/NRMRL/AEMD/DSBB  
109 T.W. Alexander Drive, Mail Drop E343-02  
RTP, NC 27711

Office 919.541.3135 | Cell 919.621.5852  
[Snow.Richard@EPA.gov](mailto:Snow.Richard@EPA.gov)

## Message

**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 8/26/2019 7:01:53 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**Subject:** FW: Phase 5 - 10 ppb Quote  
**Attachments:** ATT00001.txt

Hi Tom,  
Quote from Enthalpy for Phase 5 (10 ppb) is attached. Please review and let me know if anything needs changing or if you want to proceed.

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
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Contractor to the USEPA

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Tuesday, July 30, 2019 9:10 AM  
**To:** Craig Williams  
**Subject:** Phase 5 - 10 ppb Quote

Hi Craig,  
See proposal for Phase 5 10ppb.

**Phase 5 Scope:**

Class 5 Heavy-Duty Gasoline Truck. Testing will take place for the course of a week tentatively schedule for August 2019.

- Total Cans Phase 5 – 15 total
- 13 controllers for 1060 seconds

**Enthalpy Proposal, 10 ppb:**

Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, EPA Method TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Scan mode.

We anticipate analyzing approximately 15 canisters collected from active combustion sources at a 20x dilution with an expected reporting limit (RL) of 10ppb. In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10ppb reporting limit, and by EPA Method 3C (O2, CO2, Methane, CO) with a 0.10% reporting limit.

The total cost for this project is  which includes the analysis of up to 15 canisters at a 10 ppb RL. Included is a GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

*Supplies provided by Enthalpy:*

- 18 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 13 x ~270 cc/min Canister Samplers

Bryan Tyler  
VP Environmental Laboratory Services



800-1 Capitola Dr., Durham, NC 27713

O: 919.850.4392 x12203 | M: 919.491.5145

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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## Message

**From:** Craig Williams [CWilliams@css-inc.com]  
**Sent:** 8/26/2019 7:01:13 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**Subject:** FW: Phase 5 - 0.1 ppb Quote  
**Attachments:** ATT00001.txt

Hi Tom,  
Quote from Enthalpy for Phase 5 (0.1ppb) is attached. Please review and let me know if anything needs changing or if you want to proceed.

Craig

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
An employee-owned company  
**Contractor to the USEPA**

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Tuesday, July 30, 2019 9:13 AM  
**To:** Craig Williams  
**Subject:** Phase 5 - 0.1 ppb Quote

Hi Craig,  
See proposal for Phase 5 0.1ppb.

**Phase 5 Scope:**


Class 5 Heavy-Duty Gasoline Truck. Testing will take place for the course of a week tentatively scheduled for August 2019.

- Total Cans Phase 5 – 15 total
- 13 controllers for 1060 seconds

**Enthalpy Proposal, 0.1 ppb:**

Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

After samples have been analyzed at a 10 ppb RL if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high NOx, VOCs, CO, CO2, or other combustion products) or instrument operational viability becomes compromised. Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1ppb due to the risks involved in pushing the instrumentation past that level are significant.

The total cost for analyzing up to 7 canisters to a 0.10 ppb RL is  which includes the analysis GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

*Supplies provided by Enthalpy:*

- 18 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 13 x ~270 cc/min Canister Samplers

Bryan Tyler  
VP Environmental Laboratory Services



800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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## Message

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 6/3/2019 4:33:50 PM  
**To:** Hays, Michael [Hays.Michael@epa.gov]  
**Subject:** RE: Heavy duty tests next week

This is Phase 2 of the EtO study.

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Hays, Michael  
**Sent:** Monday, June 03, 2019 8:08 AM  
**To:** Bill Preston <BPreston@css-inc.com>; Snow, Richard <Snow.Richard@epa.gov>; George, Ingrid <George.Ingrid@epa.gov>  
**Cc:** Preston, Bill <Preston.Bill@epa.gov>; Folk, Gary <Folk.Gary@epa.gov>; Williams, Craig <williams.craig@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** RE: Heavy duty tests next week

Is this part of a bigger battery of tests? Or is this maintenance, shake-down type activity?

Thanks,  
 Mike

---

**From:** Bill Preston <BPreston@css-inc.com>  
**Sent:** Friday, May 31, 2019 11:46 AM  
**To:** Snow, Richard <Snow.Richard@epa.gov>; George, Ingrid <George.Ingrid@epa.gov>  
**Cc:** Preston, Bill <Preston.Bill@epa.gov>; Folk, Gary <Folk.Gary@epa.gov>; Hays, Michael <Hays.Michael@epa.gov>; Williams, Craig <williams.craig@epa.gov>  
**Subject:** RE: Heavy duty tests next week

Thanks for the heads up Richard! Ingrid can reply for VOC and TO11a. I don't think we can do SVOC's next week because we have the instrument tied up with SOA for another 1.5 weeks and that will require Mike being interested as well. We're definitely doing the ethanol/methanol however so Gary will be doing that for us next week because I'm booked up doing other things.

Have a great weekend!

Bill


**Bill Preston**  
 Senior Chemist  
 Contractor to the US EPA  
 109 TW Alexander Drive  
 Durham, NC 27709 (EPA RTP site)

**CSS | Office: 919.541.2719**  | [www.css-inc.com](http://www.css-inc.com)  
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

**From:** Snow, Richard [Snow.Richard@epa.gov]  
**Sent:** Friday, May 31, 2019 11:39 AM  
**To:** George, Ingrid  
**Cc:** Bill Preston (EPA)  
**Subject:** Heavy duty tests next week

Ingrid,

We will be testing the diesel fueled  next week (June 5-7) over warm start and cold start UDDS's if you want to jump in with VOC and carbonyls. We will need ethanol analysis.

We will be collecting cans for enthalpy's TO15.

**Richard Snow** | Engineering Technician  
U.S. Environmental Protection Agency/ORD/NRMRL/AEMD/DSBB  
109 T.W. Alexander Drive, Mail Drop E343-02  
RTP, NC 27711

Office 919.541.3135  | Cell 919.621.5852   
[Snow.Richard@EPA.gov](mailto:Snow.Richard@EPA.gov)



## Message

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 5/30/2019 12:22:10 PM  
**To:** Shores, Richard [Shores.Richard@epa.gov]  
**Subject:** FW: Money detectives

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

**From:** Hoyer, Marion  
**Sent:** Thursday, May 30, 2019 7:13 AM  
**To:** Cook, Rich <Cook.Rich@epa.gov>  
**Cc:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** RE: Money detectives

Hi Tom, That was my fault on the 15 vs 50! We can make that up. I am getting clearance to send 260K to Mike Hays so that Ingrid can get the new GS-MS to optimize for EtO analysis. After that, we will be in a position to further fund the dyno work and Enthalpy analysis you all are doing (i.e., another installment of \$ support for your work in July); does that sound ok?

**From:** Cook, Rich  
**Sent:** Wednesday, May 22, 2019 12:11 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Paff, Patricia <paff.patricia@epa.gov>; Klavon, Patty <Klavon.Patty@epa.gov>  
**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** RE: Money detectives

It was [redacted] not [redacted] Patricia Paff and Patty Klavon put this through and can give you the PR number. The request was made 4/7/19 and was supposed to go to Robin Harris on contract EP-C-15-008 and Work Assignment 4-034.


I just requested another [redacted] to go to you folks on 5/16.

Rich Cook  
 Health Effects, Benefits, and Air Toxics Center  
 Assessment and Standards Division  
 Office of Transportation and Air Quality  
 U. S. Environmental Protection Agency  
 (734)214-4827

**From:** Long, Thomas  
**Sent:** Wednesday, May 22, 2019 10:58 AM  
**To:** Cook, Rich <Cook.Rich@epa.gov>

**Cc:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>

**Subject:** Money detectives

We're trying to find the  you sent for the first round and I have been asked to get the PR number.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

## Message

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 5/20/2019 7:28:33 PM  
**To:** Craig Williams [CWilliams@css-inc.com]; Bryan Tyler [bryan.tyler@enthalpy.com]  
**CC:** Thorne Gregory [Thorne.Gregory@enthalpy.com]  
**Subject:** RE: VM


## Correction to Phases 3 and 4

**Phase 3**

Naturally aspirated PFI light-duty vehicle, E10 cert fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 3 – 9 source, 13 ambient, 1 blank, 1 spiked → 24 total  
 1 controller per day for cold start, source, 505 seconds.  
 1 controller for each of two days for stabilized, source, 1372 seconds  
 2 controllers for stabilized/spiked for the third day, source, 1372 seconds  
 1 controller per day for source, US06, 600 seconds.  
 2 controllers for background ambient per day, 1372 seconds  
 2 controllers per day for background ambient for 600 seconds

**Phase 4**

Turbocharged GDI  (same vehicle as Phase 1). E0 fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 3 – 9 source, 13 ambient, 1 blank, 1 spiked → 24 total  
 1 controller per day for cold start, source, 505 seconds.  
 1 controller for each of two days for stabilized, source, 1372 seconds  
 2 controllers for stabilized/spiked for the third day, source, 1372 seconds  
 1 controller per day for source, US06, 600 seconds.  
 2 controllers for background ambient per day, 1372 seconds  
 2 controllers per day for background ambient for 600 seconds

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Long, Thomas  
**Sent:** Monday, May 20, 2019 1:54 PM  
**To:** Craig Williams <CWilliams@css-inc.com>; Bryan Tyler <bryan.tyler@enthalpy.com>  
**Cc:** Thorne Gregory <Thorne.Gregory@enthalpy.com>  
**Subject:** RE: VM

Look forward to speaking with you all in a few minutes. Due to the nature of our work we do not generally share the specific make or model of vehicles we test. So we would appreciate your keeping that information confidential.

Complete:

**Phase 1**

Source: Light-duty SI vehicle

Dilution: Can 0098 was 30.16:1; Can 0080 was 18.99:1; Can 0001 was 21.18:1. The dilution ratio varied during Cans 0728, 0039, and 0066 in the range of 26:1.

Proposing:

## Phase 2

Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment operating at 21 °C. Ultra-low sulfur diesel fuel. Heavy-duty dynamometer facility. 3 replicates of source for each condition.

Condition 1: Cold start HD-UDDS (5.5 miles)

Condition 2: Warm start HD-UDDS (5.5 miles)

Both conditions will be tested on each of 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One blank will be taken.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked → 15 total

4 controllers for 1060 seconds for two of the three days

5 controller for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

## Phase 3

Naturally aspirated PFI light-duty vehicle, E10 cert fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 2 – 12 source, 13 ambient, 1 blank, 1 spiked → 27 total


1 controller per day for cold start, 505 seconds.

1 controller for each of two days for stabilized, 1372 seconds

2 controllers for stabilized/spiked for the third day, 1372 seconds

2 controllers for background ambient per day, 1372 seconds

## Phase 4

Turbocharged GDI  (same vehicle as Phase 1). E0 fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 4 -- 12 source, 13 ambient, 1 blank, 1 spiked → 27 total

1 controller per day for cold start, 505 seconds.

1 controller for each of two days for stabilized, 1372 seconds

2 controllers for stabilized/spiked for the third day, 1372 seconds

2 controllers for background ambient per day, 1372 seconds

Note: We came up short on controllers for sampling on the spiked test in Phase 1.

Thomas Long, Mechanical Engineer

Mail Drop E343-02

Building D Room 360

109 T. W. Alexander Drive

Research Triangle Park, NC 27711

Phone: 919-541-3944

---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>

**Sent:** Monday, May 20, 2019 12:47 PM

**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>

**Subject:** RE: VM

The source for the last round was the Ex. 5 Deliberative Process (EP) Gasoline Direct Injection Engine but for the next round I think they'll use a different fuel (e.g. low sulfur?). Tom will have to address this and the dilution more accurately.

Craig

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]

**Sent:** Monday, May 20, 2019 12:28 PM

**To:** Craig Williams

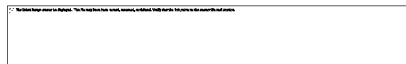
**Cc:** Thorne Gregory; Long, Thomas

**Subject:** RE: VM

Sounds good – I can send out a call-in # and invite. Can you let us know what the matrix (source and dilution) was for the last round of samples we did...that will be useful information for the discussion of the new sources to be tested.

Thanks,

Bryan Tyler  
Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>

**Sent:** Monday, May 20, 2019 12:27 PM

**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>

**Subject:** RE: VM

Yes, 2:00 is Ok with me.

Tom,  
Are you available?

Thanks

Craig Williams

Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Monday, May 20, 2019 12:23 PM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; Long, Thomas  
**Subject:** Re: VM

I'm on calls 230-430, can we do 2?

On Mon, May 20, 2019, 11:56 AM Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)> wrote:

Hi Bryan,  
Are you available for a phone call with Jacobs and EPA today around 2:15 to 2:30?

Thanks

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Friday, May 17, 2019 3:23 PM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; Long, Thomas  
**Subject:** Re: VM

Thank you for the update, looking forward to it.

On Fri, May 17, 2019, 3:17 PM Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)> wrote:

Hi Bryan,  
Yes, I certain that EPA would like the Method 3C and TO-15 but I'll confirm on Monday and schedule a call for the afternoon.

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Thursday, May 16, 2019 5:07 PM  
**To:** Craig Williams

**Cc:** Thorne Gregory; Long, Thomas

**Subject:** RE: VM

Hi Craig,

This is very helpful – thank you. Should we all plan for a Monday afternoon call to discuss? We are discussing this project internally on Monday morning.

From the earlier data – it seems like the EPA goal would be a 50-100 ppt detection limit for the Ethylene oxide. Can you advise if that would meet program objectives.

Also, is the EPA Method 3C & TO-15 needed as well?

Sincerely,

Bryan Tyler

Vice President Environmental

800-1 Capitola Dr., Durham, NC 27713

O: 919.850.4392 x12203 | M: 919.491.5145

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>

**Sent:** Thursday, May 16, 2019 3:45 PM

**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>

**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>

**Subject:** RE: VM

Hi Bryan,

It looks like we will have difficulty scheduling a conference call today or tomorrow morning and Tom is unavailable tomorrow afternoon. I've CC'd Tom here so he can elaborate on my answers and any additional follow up questions from you.

I'd like to add that the estimated cans per week would be 18-20, similar to what we did in April. Also I'd note that that heavy duty dynamometer facility will introduce more dilution to compensate for the additional exhaust from the larger diesel engines.

Will Enthalpy perform TO-15 analysis and EtO analysis similar to what was performed in April for 5 weeks of testing, about 100 SUMMA cans?

Thanks

Craig Williams

Senior Engineer

Contractor to the USEPA

CSS (Jacobs Teammate)

1910 Sedwick Road

Durham, NC 27713

Office Phone: (919) 541-0336

[www.css-inc.com](http://www.css-inc.com)

---

**From:** Craig Williams  
**Sent:** Thursday, May 16, 2019 2:58 PM  
**To:** Bryan Tyler  
**Cc:** Thorne Gregory  
**Subject:** RE: VM

Hi Bryan,  
 I'll start out with the information I have.

Source type will be diluted exhaust from the EPA's small chassis dynamometer, same facility used in April, and EPA Heavy Duty Chassis dynamometer. Two vehicles with gasoline engines and two vehicles with diesel engines tested will be:

Ex. 5 Deliberative Process (DP) Diesel Class 6 or 7 truck - 1 week testing  
~~Cross-Diesel tractor~~ - 1 week testing  
 Light Duty Vehicle (LDV) Direct Fuel Injection Engine - 2 weeks testing  
Ex. 5 Deliberative Process (DP) Gasoline Direct Injection Engine - 1 week testing

The two diesel trucks will operate on EPA heavy duty chassis dynamometer  
 The LDV and the  will operate on the EPA small chassis dynamometer

Expected concentrations for the  are similar to tests completed in April. I think the LDV would be similar as well.  
 We should more request information from EPA.

Detection limit similar to April. We should address this with EPA.

EPA would like to start testing with the F750 diesel the week of May 27.

If your available today I suggest we schedule a conference call with EPA.

Thanks,

Craig Williams  
 Senior Engineer  
 Contractor to the USEPA  
 CSS (Jacobs Teammate)  
 1910 Sedwick Road  
 Durham, NC 27713  
 Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Thursday, May 16, 2019 2:23 PM  
**To:** Craig Williams  
**Cc:** Thorne Gregory  
**Subject:** VM

Hi Craig,  
 Thank you for the VM – on calls all day. Can you let me know what type of samples will be collected. We need to know:

1. Source type
2. Ambient
3. Source
4. Expected concentrations
5. Detection limit needed



6. Testing schedule.
7. Anything and everything

Thank you,  
Bryan

Bryan Tyler  
Vice President Environmental

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O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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you are not the intended recipient, you are hereby notified that any disclosure, use, dissemination, copying, or storage of this message or its attachments is strictly prohibited.

## Message

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 5/17/2019 10:54:07 AM  
**To:** Bryan Tyler [bryan.tyler@enthalpy.com]; Craig Williams [CWilliams@css-inc.com]  
**CC:** Thorne Gregory [Thorne.Gregory@enthalpy.com]  
**Subject:** RE: VM

Craig,

We will want 3C and TO-15 as well. While the 50-100 ppt is “acceptable” we would be appreciative if they can increase the sensitivity – especially on the background (ambient) samples. We report differences between source emissions and background concentrations which makes NDs problematic when source emissions are near the detection limit.

The heavy-duty diesel trucks should have lower CO and possibly higher NOx than the spark ignition light-duty vehicles (including the Ex. 4 CBI).

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Bryan Tyler <bryan.tyler@enthalpy.com>  
**Sent:** Thursday, May 16, 2019 5:08 PM  
**To:** Craig Williams <CWilliams@css-inc.com>  
**Cc:** Thorne Gregory <Thorne.Gregory@enthalpy.com>; Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** RE: VM

Hi Craig,

This is very helpful – thank you. Should we all plan for a Monday afternoon call to discuss? We are discussing this project internally on Monday morning.

From the earlier data – it seems like the EPA goal would be a 50-100 ppt detection limit for the Ethylene oxide. Can you advise if that would meet program objectives.

Also, is the EPA Method 3C & TO-15 needed as well?

Sincerely,

Bryan Tyler  
 Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713  
 O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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**From:** Craig Williams <CWilliams@css-inc.com>**Sent:** Thursday, May 16, 2019 3:45 PM**To:** Bryan Tyler <bryan.tyler@enthalpy.com>**Cc:** Thorne Gregory <Thorne.Gregory@enthalpy.com>; Long, Thomas <Long.Thomas@epa.gov>**Subject:** RE: VM

Hi Bryan,

It looks like we will have difficulty scheduling a conference call today or tomorrow morning and Tom is unavailable tomorrow afternoon. I've CC'd Tom here so he can elaborate on my answers and any additional follow up questions from you.

I'd like to add that the estimated cans per week would be 18-20, similar to what we did in April. Also I'd note that that heavy duty dynamometer facility will introduce more dilution to compensate for the additional exhaust from the larger diesel engines.

Will Enthalpy perform TO-15 analysis and EtO analysis similar to what was performed in April for 5 weeks of testing, about 100 SUMMA cans?

Thanks

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Craig Williams**Sent:** Thursday, May 16, 2019 2:58 PM**To:** Bryan Tyler**Cc:** Thorne Gregory**Subject:** RE: VM

Hi Bryan,

I'll start out with the information I have.

Source type will be diluted exhaust from the EPA's small chassis dynamometer, same facility used in April, and EPA Heavy Duty Chassis dynamometer. Two vehicles with gasoline engines and two vehicles with diesel engines tested will be:

Ex. 5 Deliberative Process (DP) Diesel Class 6 or 7 truck - 1 week testing  
Ex. 5 Deliberative Process (DP) Diesel tractor - 1 week testing  
 Light Duty Vehicle (LDV) Direct Fuel Injection Engine - 2 weeks testing  
Ex. 5 Deliberative Process (DP) Gasoline Direct Injection Engine - 1 week testing

The two diesel trucks will operate on EPA heavy duty chassis dynamometer  
 The LDV and the Ex. 5 Deliberative Process (DP) will operate on the EPA small chassis dynamometer

Expected concentrations for the Ex. 5 Deliberative Process (DP) are similar to tests completed in April. I think the LDV would be similar as well. We should more request information from EPA.

Detection limit similar to April. We should address this with EPA.

EPA would like to start testing with the Ex. 5 Deliberative Process (DP) diesel the week of May 27.

If your available today I suggest we schedule a conference call with EPA.

Thanks,

Craig Williams  
Senior Engineer  
Contractor to the USEPA  
CSS (Jacobs Teammate)  
1910 Sedwick Road  
Durham, NC 27713  
Office Phone: (919) 541-0336  
[www.css-inc.com](http://www.css-inc.com)

---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]  
**Sent:** Thursday, May 16, 2019 2:23 PM  
**To:** Craig Williams  
**Cc:** Thorne Gregory  
**Subject:** VM

Hi Craig,

Thank you for the VM – on calls all day. Can you let me know what type of samples will be collected. We need to know:

1. Source type
2. Ambient
3. Source
4. Expected concentrations
5. Detection limit needed
6. Testing schedule.
7. Anything and everything

Thank you,  
Bryan

Bryan Tyler  
Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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## Title

Mobile Source Ethylene Oxide (EtO) Emissions Measurement and Characterization

## Vehicles

- Ex. 5 Deliberative Process (DP) with 5,570 miles on a 2.7 L turbocharged wall-guided GDI
- Ex. 5 Deliberative Process (DP) with NNNN miles on a 6.7L heavy-duty diesel truck (HDDT) equipped with EGR, DPF, SCR, and DOC.
- A heavy-duty spark ignition vehicle
- Template: YYYY Make Model with NNNN miles on a NN liter <turbocharged|naturally aspirated><PFI|Diesel|GDI>

Vehicles were selected at the request of the Office of Transportation and Air Quality (OTAQ).

## Chassis Dynamometer Driving Schedules

The light-duty vehicles were/will be tested at an ambient temperature of 72 °F (22 °C).

- [ HYPERLINK "http://www.epa.gov/otaq/emisslab/methods/huddscol.txt" ] (FTP)
- The Supplemental FTP (SFTP) also known as US06

The heavy-duty vehicles were/will be tested in the laden condition (90% GCWR).

- Cold start HD-UDDS
- Warm start HD-UDDS

These driving cycles will be repeated three times for each vehicle.

## Measurements

### Core phase level dynamometer bench measurements

- Total hydrocarbon (THC)
- non-methane hydrocarbons (NMHC),
- non-methane organic gas (NMOG),
- oxides of nitrogen (NO<sub>x</sub>),
- nitrogen dioxide (NO<sub>2</sub>),
- carbon monoxide (CO),
- carbon dioxide (CO<sub>2</sub>) and
- gravimetric particulate matter (PM)

### Particulates

- Gravimetric mass
- EC/OC
- Particle size distribution, Engine Exhaust Particle Sizer (EEPS).

### Speciation

Chassis dynamometer testing shall also generate speciated (speciated VOC) data.

OS



Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

After samples have been analyzed at a 10 ppb RL if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high NO<sub>x</sub>, VOCs, CO, CO<sub>2</sub>, or other combustion products) or instrument operational viability becomes compromised. Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1ppb due to the risks involved in pushing the instrumentation past that level are significant.

The total cost for analyzing up to 7 canisters to a 0.10 ppb RL includes the analysis GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

Supplies provided by Enthalpy:

- 18 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 250 cc/min Canister Samplers

#### Round 3 (July 8-12)

Vehicle: MY2013 sequential PFI

Ex. 5 Deliberative Process (DP)

Fuel: Tier 3 E10 cert fuel

Lab: Light-duty dynamometer facility.

Sampling days: 3

Driving schedules: FTP75 and Supplemental FTP.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting spare).

#### Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds
- 3 controllers set for 505 seconds.
- 10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)
- 9 controllers set for 596 seconds (3 source, 6 background)
- The blank and the outdoor ambient sample do not require controllers.

#### Summary:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Round 4 (August 26-30)

Vehicle: Turbocharged GDI [ ] (same vehicle as Phase 1).

Fuel: Tier 3 certification fuel (E10)

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

#### Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting the spare).

#### Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

#### Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Round 5 (Oct 21-25)

Vehicle: Gasoline heavy-duty truck Ex. 5 Deliberative Process (DP) 3WC

Fuel: Cert 3.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) Two of the hot-start test sample cans will be spiked with EtO prior to sample collection on one day in addition to one that is not spiked. One blank will be taken during the test week.

#### Total Cans Phase 5 –

- 4 - Dilution air background
- 1 - Blank
- 2 - Spikes
- 6 - Cold start HD-UDDS

### 3 - Warm start HD-UDDS

Duration for all canisters is 1060 seconds. The nominal flow rate will be approximately 270 cc/min.

#### Round 6 (Nov 11-15)

Vehicle: Turbocharged GDI   (same vehicle as Round 1 and Round 4).

Fuel: Ethanol free fuel from a local station

Lab: Light-duty dynamometer facility.

Sampling days: Four test days.

Each of three days there will be an FTP75. On the fourth day there will be three US06. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and, on the last day, the 596 second – 8.01 mile transient US06.

#### Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting the spare).

#### Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

#### Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds

- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Round 7 (delayed due to truck repair)

Vehicle: 2011 Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) I-6 6.7L, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF (PTOx), SCRC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedules:

- Transient 3 Warm-up (no samples?)
- 20 minute soak
- Transient 3 (668 seconds, 2.85 miles)
- 20 minute soak
- HD-UDDS (1060 second, 5.5 miles)
- 25 minute soak (to allow for reading bags)
- Steady acceleration to 60 mph and hold for six minutes. Sample for the last 5 minutes at steady state. Stop sampling as the vehicle decelerates to 0 and turns off.

SUMMA cans for EtO and TO-15 analyses will be collected at three locations: pre-SCR, post-DPF, and dilution tunnel. A background can will be collected in the test bay during the HD-UDDS.

#### Total Cans Round 5 –

3 source cans per cycle, 3 days with 3 cycles, 27 source cans

1 ambient can per test day, 3 ambient cans

1 blank

1 spiked steady state on each of two days, 2 spiked cans

1 can spiked with interferents as well as EtO

9 controllers at 668 seconds (for Trans3)

12 controllers at 1060 seconds (for HD-UDDS and ambient background)

12 controllers at 600 seconds (for steady state samples and spiked samples)

Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide.

Samples will be collected into batch blank checked Silco/Silonite lined sampling canisters (volume TBD).

Samples will be returned to Enthalpy's lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

#### Round 8 (TBD)

Vehicle: Class 8 HDDT per study with James Sanchez

Fuel: ULSD

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

This program includes the EtO sampling of the truck used in a separate study. There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Round 6 – 6 source, 7 ambient, 1 blank, 1 spiked □ 15 total (not including spare)

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, **3@1060** seconds.
- 1 controller/can for each of three days for warm start HD-UDDS, source, **3@1060** seconds
- **1** controllers/cans for stabilized/spiked for the third day, source, **1@1060** seconds
- 2 controllers/cans for background ambient per each of three days, **6@1060** seconds
- **1** can for outside background
- **1** can for blank
- **1** spare

## Message

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 10/8/2019 7:04:01 PM  
**To:** Laroo, Chris [laroo.chris@epa.gov]  
**CC:** Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: Missing Data Request - Ex. 5 Deliberative Process (DP) EtO Testing

I'll add those columns to our spreadsheets. (And then put data in the columns 😊)

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Laroo, Chris <laroo.chris@epa.gov>  
**Sent:** Tuesday, October 08, 2019 2:31 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** Missing Data Request - Ex. 5 Deliberative Process (DP) EtO Testing

Tom,

I am missing two pieces of data to enable some analysis that we want to perform on the test results. Could you please send me the CVS vmix values and the miles driven for each of the Ex. 5 Deliberative Process (DP) tests. The results that you sent us does not include those values. Thanks.

Regards,

Chris Laroo  
Environmental Protection Specialist  
US Environmental Protection Agency  
Office of Transportation and Air Quality  
Assessment and Standards Division  
2000 Traverwood Dr.  
Ann Arbor, MI 48105  
(734) 214-4937  
(734) 214-4055 (fax)  
Email: laroo.chris@epa.gov

Message

---

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 10/3/2019 2:13:09 PM  
**To:** Craig Williams [CWilliams@css-inc.com]  
**Subject:** RE: Enthalpy Round 5

Yes, thank you.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Thursday, October 03, 2019 10:09 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** RE: Enthalpy Round 5

Hi Tom,  
Enthalpy replied that they can provide supplies for testing on October 14 and that they plan on cleaning Phase 3 and Phase 4 canisters starting tomorrow unless we advise otherwise. Can I advise them that is OK to clean canisters from Phase 3 and Phase 4?

Thanks

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
An employee-owned company  
**Contractor to the USEPA**

---

**From:** Craig Williams  
**Sent:** Thursday, October 03, 2019 9:35 AM  
**To:** Long, Thomas  
**Cc:** Snow, Richard; Faircloth, James  
**Subject:** RE: Enthalpy Round 5

Hi Tom,  
I've requested an updated quote from Enthalpy for Phase 5 and am waiting on a reply.

Craig

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
An employee-owned company  
**Contractor to the USEPA**

---

**From:** Long, Thomas [Long.Thomas@epa.gov]  
**Sent:** Wednesday, October 02, 2019 3:13 PM



**To:** Craig Williams; Williams, Craig  
**Cc:** Snow, Richard; Faircloth, James  
**Subject:** Enthalpy Round 5

Well, we had our meeting this morning and things have changed a bit. Instead of testing a heavy-duty gas truck, we're going to re-test the [REDACTED]

We would like to commence testing on the 14<sup>th</sup> or at least no later than the 21<sup>st</sup>.

James will confirm availability of the [REDACTED]

Craig, can Enthalpy provide the necessary cans and controllers in that time-frame? It would mean having the cans/controllers on the 11<sup>th</sup> (14<sup>th</sup> at the latest).

Here is an overview of the proposed testing:

#### Round 5

Vehicle: [REDACTED] Regular Cab, [REDACTED] I-6 6.7L, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF (PTOx), SCRC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedules:

- Transient 3 Warm-up (no samples?)
  - 20 minute soak
  - Transient 3 (668 seconds, 2.85 miles)
  - 20 minute soak
  - HD-UDDS (1060 second, 5.5 miles)
  - 25 minute soak (to allow for reading bags)
  - Steady acceleration to 60 mph and hold for six minutes. Sample for the last 5 minutes at steady state.
- Stop sampling as the vehicle decelerates to 0 and turns off.

SUMMA cans for EtO and TO-15 analyses will be collected at three locations: pre-SCR, post-DPF, and dilution tunnel. A background can will be collected in the test bay during the HD-UDDS.

#### Total Cans Round 5 –

3 source cans per cycle, 3 days with 3 cycles, 27 source cans

1 ambient can per test day, 3 ambient cans

1 blank

1 spiked steady state on each of two days, 2 spiked cans

1 can spiked with interferents as well as EtO

9 controllers at 668 seconds (for Trans3)

12 controllers at 1060 seconds (for HD-UDDS and ambient background)

12 controllers at 600 seconds (for steady state samples and spiked samples)

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711

Phone: 919-541-3944

## Message

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 10/2/2019 1:40:25 PM  
**To:** Snow, Richard [Snow.Richard@epa.gov]  
**Subject:** RE: Proposal

I see what I did.

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

**From:** Snow, Richard <Snow.Richard@epa.gov>  
**Sent:** Wednesday, October 02, 2019 9:38 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** RE: Proposal

James is gonna say we need more flow controllers. One for each can?

**From:** Long, Thomas <Long.Thomas@epa.gov>  
**Sent:** Wednesday, October 02, 2019 9:30 AM  
**To:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** Proposal

Vehicle: Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) -6 6.7L, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)  
 Fuel: Ultra-low sulfur diesel fuel.  
 Lab: Heavy-duty dynamometer facility.  
 Sampling days: 3  
 Driving schedule:

Transient 3 Warm-up  
 20 minute soak  
 Transient 3  
 20 minute soak  
 HD-UDDS (1060 second, 5.5 miles)  
 25 minute soak (to allow for reading bags)  
 Steady acceleration to 60 mph and hold for six minutes. Sample for the last 5 minutes at steady state. Stop sampling as the vehicle decelerates to 0 and turns off.

SUMMA cans for EtO and TO-15 analyses will be collected at three locations: pre-SCR, post-DPF, and dilution tunnel. A background can will be collected in the test bay during the HD-UDDS.

Total Cans Round 5 –  
 3 source cans per cycle, 3 days with 3 cycles, 27 source cans  
 1 ambient can per test day, 3 ambient cans

1 blank

1 spiked steady state on each of two days, 2 spiked cans

3 controllers at 315 seconds (for Trans3)

4 controllers at 1060 seconds (for HD-UDDS and ambient background)

5 controllers at 600 seconds (for steady state samples and spiked samples)

.


Enthalpy Analytical (Durham, NC) will complete the analysis of combustion gas samples for Ethylene oxide. Samples will be collected into batch blank checked Silco/Silonite lined sampling canisters (volume TBD). Samples will be returned to Enthalpy's lab and analyzed by GC/MS operating in the Selective Ion Mode (SIM).

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

Message

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**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 8/5/2019 4:16:17 PM  
**To:** Kariher, Peter [Kariher.Peter@epa.gov]  
**Subject:** RE: Phase 3 report  
**Attachments:**  EtO-TO15 Emission Results (Enthalpy 0519-205R).pdf

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Sent:** Monday, August 05, 2019 11:11 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** Phase 3 report

Thanks,

Peter

++++  
Peter H. Kariher  
Chemist  
US EPA  
Stationary Source Branch  
Air & Energy Management Division  
National Risk Management Research Laboratory  
Office of Research and Development  
(919) 541-5740  
<mailto:kariher.peter@epa.gov>  
++++

## Title

Mobile Source Ethylene Oxide (EtO) Emissions Measurement and Characterization

## Vehicles

- Ex. 5 Deliberative Process (DP) with 5,570 miles on a 2.7 L turbocharged wall-guided GDI
- Ex. 5 Deliberative Process (DP) with NNNN miles on a 6.7L heavy-duty diesel truck (HDDT) equipped with EGR, DPF, SCR, and DOC.
- A heavy-duty spark ignition vehicle
- Template: YYYY Make Model with NNNN miles on a NN liter <turbocharged|naturally aspirated><PFI|Diesel|GDI>

Vehicles were selected at the request of the Office of Transportation and Air Quality (OTAQ).

## Chassis Dynamometer Driving Schedules

The light-duty vehicles were/will be tested at an ambient temperature of 72 °F (22 °C).

- [ [HYPERLINK "http://www.epa.gov/otaq/emisslab/methods/huddscol.txt"](http://www.epa.gov/otaq/emisslab/methods/huddscol.txt) ] (FTP)
- The Supplemental FTP (SFTP) also known as US06

The heavy-duty vehicles were/will be tested in the laden condition (90% GCWR).

- Cold start HD-UDDS
- Warm start HD-UDDS

These driving cycles will be repeated three times for each vehicle.

## Measurements

Core phase level dynamometer bench measurements

- Total hydrocarbon (THC)
- non-methane hydrocarbons (NMHC),
- non-methane organic gas (NMOG),
- oxides of nitrogen (NO<sub>x</sub>),
- nitrogen dioxide (NO<sub>2</sub>),
- carbon monoxide (CO),
- carbon dioxide (CO<sub>2</sub>) and
- gravimetric particulate matter (PM)

Particulates

- Gravimetric mass
- EC/OC
- Particle size distribution, Engine Exhaust Particle Sizer (EEPS).

Speciation

Chassis dynamometer testing shall also generate speciated (speciated VOC) data.

- Volatile organic compound (VOC) compounds of interest include C1 – C12 hydrocarbons as well as

light alcohols and carbonyls. (Passivated cans Compendium Method TO-15)

- Carbonyls (TO-11a)
- Oxygenates (CARB method 1001)
- Ethylene Oxide (EtO) (Passivated cans Compendium Method TO-15)

#### Core portable emissions measurement system (PEMS) measurements

- Total hydrocarbon (THC)
- nitrogen oxide (NO)
- oxides of nitrogen (NO<sub>x</sub>)
- nitrogen dioxide (NO<sub>2</sub>)
- carbon monoxide (CO)
- carbon dioxide (CO<sub>2</sub>)

#### Fuel

Fuels will be submitted to OTAQ for analysis.

#### Schedule

##### Phase 1 (Complete)

Source: Ex. 5 Deliberative Process (DP) 2.7L GDI

Fuel: Cert 3 E10

Lab: Light-duty dynamometer facility

Sampling days: 3

Driving schedule: FTP75

Sources: Phase 1 cold start and composite of Phase 2 stabilized with Phase 3 hot start

##### Phase 2 (June 5-12, Complete)

Vehicle: Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There was both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both were tested on each of the 3 days of testing. Each day there was a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans was spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked □ 15 total

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

## Phase 3 (July 8-12)

Vehicle: MY2013 sequential I

**Ex. 4 CBI**

Fuel: Tier 3 E10 cert fuel

Lab: Light-duty dynamometer facility.

Sampling days: 3

Driving schedules: FTP75 and Supplemental FTP.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

## Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting spare).

## Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds
- 3 controllers set for 505 seconds.
- 10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)
- 9 controllers set for 596 seconds (3 source, 6 background)
- The blank and the outdoor ambient sample do not require controllers.

## Summary:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background



- 1 can for blank
- 1 spare

#### Phase 4 (July 22-26)

Vehicle: Turbocharged GDI   (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel (ethanol free) or market E0 fuel

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

#### Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting the spare).

#### Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

#### Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds

- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Phase 5 (August 12-16)

Vehicle: Gasoline heavy-duty truck

Fuel: TBD.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 5 – 6 source, 7 ambient, 1 blank, 1 spiked □ 15 total (not including spare)

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

#### Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@1060 seconds.
- 1 controller/can for each of three days for warm start HD-UDDS, source, 3@1060 seconds
- 1 controllers/cans for stabilized/spiked for the third day, source, 1@1060 seconds
- 2 controllers/cans for background ambient per each of three days, 6@1060 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Phase 6 (TBD)

Vehicle: Class 8 HDDT per study with James Sanchez

Fuel: ULSD.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

This program includes the EtO sampling of the truck used in a separate study. There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 6 – 6 source, 7 ambient, 1 blank, 1 spiked □ 15 total (not including spare)

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, **3@1060** seconds.
- 1 controller/can for each of three days for warm start HD-UDDS, source, **3@1060** seconds
- **1** controllers/cans for stabilized/spiked for the third day, source, **1@1060** seconds
- 2 controllers/cans for background ambient per each of three days, **6@1060** seconds
- **1** can for outside background
- **1** can for blank
- **1** spare

Message

---

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 6/19/2019 4:18:23 PM  
**To:** Craig Williams [CWilliams@css-inc.com]  
**Subject:** RE: Phases 3 & 4

My next job.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Craig Williams <CWilliams@css-inc.com>  
**Sent:** Wednesday, June 19, 2019 12:17 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Subject:** FW: Phases 3 & 4

Hi Tom,  
Did you have a chance to look over the scopes of 3 & 4?


Thanks

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
An employee-owned company  
**Contractor to the USEPA**

---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Wednesday, June 19, 2019 11:56 AM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; David Berkowitz  
**Subject:** RE: Phases 3 & 4

Craig,  
Can you please confirm the below scopes ASAP...thank you.

Bryan Tyler  
VP Environmental Laboratory Services  
  
800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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[Terms and Conditions](#) & [Enthalpy Sample Acceptance Policy](#)*

---

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Sent:** Tuesday, June 18, 2019 9:04 AM  
**To:** 'Craig Williams' <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Cc:** 'Thorne Gregory' <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; 'David Berkowitz' <[David.Berkowitz@enthalpy.com](mailto:David.Berkowitz@enthalpy.com)>  
**Subject:** Phases 3 & 4  
**Importance:** High

Craig,

See below orders, please note for phases 3 & 4 we will be using ambient Silco lined 15L canisters, with this job pushing to July we had to change the canisters size due to availability. Controller flows have also been changed to allow for your specified collection durations. Please review and confirm the below orders:

IMPORTANT: The same controllers/samplers will be used week of 7/8 & 7/15, we request that at the end of each day during Phase 3 the used controllers be delivered to Enthalpy for cleaning so they can be ready for the Phase 4 order.

Phase To be ready for delivery on Monday 7/8:

- 28 x 15L Silco canisters (batch 0.05 ppb TO-15)
- 12 x Soil Gas Samplers @ 550 cc/min - 1372 seconds (individual 0.05 ppb TO-15)
- 10 x Soil Gas Samplers @ 1400 cc/min - 505-600 seconds (individual 0.05 ppb TO-15)

To be ready for delivery on Monday 7/15:

- 28 x 15L Silco canisters (batch 0.05 ppb TO-15)
- 12 x Soil Gas Samplers @ 550 cc/min - 1372 seconds (individual 0.05 ppb TO-15)
- 10 x Soil Gas Samplers @ 1400 cc/min - 505-600 seconds (individual 0.05 ppb TO-15)

Bryan Tyler  
VP Environmental Laboratory Services



800-1 Capitola Dr., Durham, NC 27713  
O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Sent:** Tuesday, June 11, 2019 8:48 AM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; David Berkowitz <[David.Berkowitz@enthalpy.com](mailto:David.Berkowitz@enthalpy.com)>  
**Subject:** RE: Phase 3 - 10 ppb Quote

Hi Bryan,  
Yes, EPA would like 22 controllers for both phases, 3 and 4.

Craig

**Craig Williams**  
Engineer  
**CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)**  
An employee-owned company

**Contractor to the USEPA**



---

**From:** Bryan Tyler [bryan.tyler@enthalpy.com]  
**Sent:** Monday, June 10, 2019 11:03 AM  
**To:** Craig Williams  
**Cc:** Thorne Gregory; David Berkowitz  
**Subject:** RE: Phase 3 - 10 ppb Quote

Craig,

With this not happening until July we should be good...do the below controllers needs represent what is needed for Phase 3 & 4?

Bryan Tyler  
 VP Environmental Laboratory Services

  
 800-1 Capitola Dr., Durham, NC 27713  
 O: 919.850.4392 x12203 | M: 919.491.5145  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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[Terms and Conditions](#) & [Enthalpy Sample Acceptance Policy](#)*

---

**From:** Craig Williams <[CWilliams@css-inc.com](mailto:CWilliams@css-inc.com)>  
**Sent:** Friday, June 7, 2019 10:22 AM  
**To:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Cc:** Thorne Gregory <[Thorne.Gregory@enthalpy.com](mailto:Thorne.Gregory@enthalpy.com)>; David Berkowitz <[David.Berkowitz@enthalpy.com](mailto:David.Berkowitz@enthalpy.com)>  
**Subject:** RE: Phase 3 - 10 ppb Quote

Hi Bryan,

EPA has decided to postpone the start date for Phase 3 testing until the week of July 8 and would like to plan on delivery of the cans on Monday, July 8.

Please see EPA's comments regarding the number of controllers below. I also think he missed the spare when counting the cans because I get 25 cans not 24 but that's Ok since your quote was for 28 cans. Can you prove the number of controllers he requested?

The Enthalpy quote looks good except the number of canister samplers. I do not want to reuse controllers for fear of possible cross-contamination:

24 cans => 22 controllers (3@505x+2@1372s+2@1372s+3@600s+6@1372s+6@600s)

Based on:

- 1 controller/can per each of **three** days for cold start, source, 3@505 seconds.
- 1 controller/can for each of **two** days for stabilized, source, 2@1372 seconds
- x2** controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of **three** days for source, US06, 3@600 seconds.
- 2 controllers/cans for background ambient per each of **three** days, 6@1372 seconds
- 2 controllers/cans per each of **three** days for background ambient for 6@600 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

**Craig Williams**

Engineer

CSS | Office: 919.541.0336 | [www.css-inc.com](http://www.css-inc.com)

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---

**From:** Bryan Tyler [[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)]

**Sent:** Friday, May 24, 2019 11:48 AM

**To:** Craig Williams

**Cc:** Thorne Gregory; David Berkowitz

**Subject:** Phase 3 - 10 ppb Quote

Hi Craig,

See proposal for Phase 3 10ppb.

**Phase 3 Scope:**

Naturally aspirated PFI light-duty vehicle, E10 cert fuel. Light-duty dynamometer facility. Three test days.

Total Cans Phase 3 – 9 source, 13 ambient, 1 blank, 1 spike -> 24 total

1 controller per day for cold start, source, 505 seconds.

1 controller for each of two days for stabilized, source, 1372 seconds

2 controllers for stabilized/spiked for the third day, source, 1372 seconds

1 controller per day for source, US06, 600 seconds.

2 controllers for background ambient per day, 1372 seconds

2 controllers per day for background ambient for 600 seconds

**Enthalpy Proposal, 10 ppb:**

Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, EPA Method TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0419-093. Samples will be collected into batch blank checked 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Scan mode.

We anticipate analyzing approximately 24 canisters collected from active combustion sources at a 20x dilution with an expected reporting limit (RL) of 10ppb. In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10ppb reporting limit, and by EPA Method 3C (O2, CO2, Methane, CO) with a 0.10% reporting limit.

The total cost for this project is Ex. 5 Deliberative Process (DP) which includes the analysis of up to 24 canisters at a 10 ppb RL. Included is a GC/MS instrument setup charge, sampling equipment rental, shipping and sample analysis.

**Supplies to be ready on 6/13/2019:**

*Supplies provided by Enthalpy:*

- 28 x 6L Sampling Canisters (Batch 0.10ppb TO-15)
- 5 x 550 cc/min Canister Samplers
- 5 x 200 cc/min Canister Samplers

Bryan Tyler

Vice President Environmental



800-1 Capitola Dr., Durham, NC 27713

O: 919.850.4392 x12203 | M: 919.491.5145

[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)

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CONFIDENTIALITY NOTICE: The contents of this email message and any attachments are intended solely for the addressee(s) and may contain confidential, proprietary and/or privileged information and may be legally protected from disclosure. If you are not the intended recipient of this message or their agent, or if this message has been addressed to you in error, please immediately alert the sender by reply email and then delete this message and any attachments and the reply from your system. If you are not the intended recipient, you are hereby notified that any disclosure, use, dissemination, copying, or storage of this message or its attachments is strictly prohibited.

CONFIDENTIALITY NOTICE: The contents of this email message and any attachments are intended solely for the addressee(s) and may contain confidential, proprietary and/or privileged information and may be legally protected from disclosure. If you are not the intended recipient of this message or their agent, or if this message has been addressed to you in error, please immediately alert the sender by reply email and then delete this message and any attachments and the reply from your system. If you are not the intended recipient, you are hereby notified that any disclosure, use, dissemination, copying, or storage of this message or its attachments is strictly prohibited.



## Message

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 6/14/2019 11:34:03 AM  
**To:** Shores, Richard [Shores.Richard@epa.gov]  
**Subject:** FW: Funds to NRMRL for EtO

The dyno-Enthalpy portion needs the initial

Ex. 5 Deliberative Process (DP)

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Hoyer, Marion  
**Sent:** Friday, June 14, 2019 7:19 AM  
**To:** Cook, Rich <Cook.Rich@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Hays, Michael <Hays.Michael@epa.gov>  
**Subject:** Funds to NRMRL for EtO

Hi There,

I'm going to try to capture where we are with funding and where we need to be through the end of FY19.

Overall, it sounds like the total for the dyno research, EtO analysis, canisters and the GC-MS, the total is

- Rich initiated a PR in April for (not sure on status, it is taking forever for this to show up on your books☹)
- Rich initiated a second PR in May for after the positive finding in the . Rich – can you check on the status of that?
- Our FCO was working yesterday on getting the for the GC-MS transferred.

If those three things have happened, then we need to get you between now and the end of September. Is that all correct?

Thanks!  
 Marion

Message

---

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 7/26/2019 5:36:26 PM  
**To:** Snow, Richard [Snow.Richard@epa.gov]  
**Subject:** RE: Spiked EtO cans

Nicely done. Thanks. That is certainly more comforting than 200% plus recovery.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Snow, Richard  
**Sent:** Friday, July 26, 2019 1:30 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** RE: Spiked EtO cans

Just a volume correction

---

**From:** Long, Thomas  
**Sent:** Friday, July 26, 2019 1:26 PM  
**To:** Snow, Richard <Snow.Richard@epa.gov>  
**Subject:** RE: Spiked EtO cans

Your calculations didn't come through with the email.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Snow, Richard  
**Sent:** Friday, July 26, 2019 1:25 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>  
**Cc:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Subject:** Spiked EtO cans

Based on the EtO discussion this morning, james and I come up with recalculated recoveries of 77% and 129% on the Ex. 5 Deliberative Process (DP) respectively.

**Richard Snow** | Engineering Technician  
U.S. Environmental Protection Agency/ORD/NRMRL/AEMD/DSBB

109 T.W. Alexander Drive, Mail Drop E343-02  
RTP, NC 27711

Office 919.541.3135 | Cell 919.621.5852  
[Snow.Richard@EPA.gov](mailto:Snow.Richard@EPA.gov)

Message

---

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 7/26/2019 5:00:13 PM  
**To:** Snow, Richard [Snow.Richard@epa.gov]  
**Subject:** RE: F750 data review

That guy from OTAQ is using the flows to help interpret differences in CEM CO2 versus can CO2.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Snow, Richard  
**Sent:** Friday, July 26, 2019 12:56 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** RE: F750 data review

Tagged flow rates were recorded in the lab notebook for the [REDACTED]. The [REDACTED] flow rates were all the same, and the same as used by Peter to spike.

You should have all the nominal flow rates from emails from enthalpy/Craig Williams.

If you're looking for the nominal flow rates for each and every flow controller, I only have that in the lab notebook for the [REDACTED]. We would need to get the [REDACTED] Ex. 5 Deliberative Process (DP) can flows from enthalpy.

---

**From:** Long, Thomas  
**Sent:** Friday, July 26, 2019 12:52 PM  
**To:** Snow, Richard <Snow.Richard@epa.gov>  
**Subject:** RE: F750 data review

Thanks. Where was that?

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Snow, Richard  
**Sent:** Friday, July 26, 2019 12:51 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** RE: F750 data review

505's ~ 670 ml/min  
 1372's ~ 180 ml/min  
 1060's ~ 180 ml/min

Controller #s used are logged on the canister sample log. Tagged flow rates were recorded in the lab notebook for the [ ] and not recorded for the [Ex. 5 Deliberative Process (DP)]

**From:** Long, Thomas

**Sent:** Friday, July 26, 2019 12:13 PM

**To:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>

**Subject:** FW: [Ex. 4 CBI] data review

Richard,

Would you have a chance to look up the nominal flow of the controllers for each of the sample periods asked about below (505s, 1372s, 1060s)? Where do we have that logged?

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

**From:** Hoyer, Marion

**Sent:** Friday, July 26, 2019 11:58 AM

**To:** Long, Thomas <Long.Thomas@epa.gov>

**Cc:** Walters, Charles <walters.charles@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>

**Subject:** FW: [Ex. 4 CBI] data review

Hi Tom,

Here are the questions Chuck has. Thanks for letting us know your thoughts.  
 Marion

**From:** Walters, Charles

**Sent:** Thursday, July 25, 2019 10:54 AM

**To:** Cullen, Angela <cullen.angela@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>

**Subject:** [Ex. 4 CBI] data review

All,

I reviewed the dyno data and Enthalpy report for the [ ] Since there are concerns with the EtO analysis; I only focused on canister sample collection and CO2 agreement. Here are my observations.

- The uncorrected bag CO2 vs canister CO2 agreed within 3% (see yellow areas in spreadsheet). This is significantly better than the [ ] testing. I noticed that the vacuum decay in the canister was considerably smaller than the testing done on the [ ]. The [ ] final Pratos averaged 0.549; which is very near the 0.528 theoretical choked

flow Pratio limit for an orifice. This would result in a more constant sample flow over the test phase providing a more representative sample over the phase. This could explain the better CO2 agreement in the [Ex. 5 Deliberative Process (DP)] testing.

- Enthalpy presented the canister pressurization data differently for the [Ex. 5 Deliberative Process (DP)]. It would be helpful if the data presentation was consistent. Specifically, the [ ] report provided controller flow data for “initial flow” and “return flow” whereas the [ ] report did not. I assume the “return flow” is the flowrate recorded at the end of sample canister vacuum using an inert gas. This data is very helpful in determining final flow rate as a function of vacuum decay over the sample phase. The [ ] flow data shows initial vs return flow to be very similar (as expected due to the ending Pratio very near the theoretical limit of 0.528 as discussed above). It would be nice to have this data for the [ ] and any future testing.

### **Proposed questions to Enthalpy and/or ORD**

Below are proposed questions to Enthalpy. These questions are designed to get a better understanding of the before and after state of the sample flow and perhaps influence the controller flow selected for the sample period. I know that this method is still considered qualitative; however, if it transitions to quantitative we will need a better handle on the sample flow and proportionality. I’m not sure if now is the right time to be asking these questions nor do I have a read on cost impacts in asking these questions. We should discuss.

- Is “initial flow” vs “return flow” available for the [Ex. 4 CBI] similar to the data presented on page 89 of the [ ] report)?
- Can the “initial flow” vs “return flow” data be included in the report for any future testing?
- Is “return flow” measured at the “as received” canister vacuum?
- What nominal flow rate is selected for each sample period? 505s, 1372s, 1060s
- What nominal flow rate options are available?

Thanks,  
Chuck

## Message

**From:** Long, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6A9FA4371E4E3682E45E51082A8FE9-THOMAS, LONG]  
**Sent:** 7/26/2019 4:58:20 PM  
**To:** Snow, Richard [Snow.Richard@epa.gov]  
**Subject:** RE: F750 data review

Sounds like another revision to the can logs is called for.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Snow, Richard  
**Sent:** Friday, July 26, 2019 12:56 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** RE: F750 data review

Tagged flow rates were recorded in the lab notebook for the [REDACTED] flow rates were all the same, and the same as used by Peter to spike.

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If you're looking for the nominal flow rates for each and every flow controller, I only have that in the lab notebook for the [REDACTED]. We would need to get the [REDACTED] can flows from enthalpy.

---

**From:** Long, Thomas  
**Sent:** Friday, July 26, 2019 12:52 PM  
**To:** Snow, Richard <Snow.Richard@epa.gov>  
**Subject:** RE: [REDACTED] data review

Thanks. Where was that?

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Snow, Richard  
**Sent:** Friday, July 26, 2019 12:51 PM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** RE: [REDACTED] data review

505's ~ 670 ml/min  
 1372's ~ 180 ml/min  
 1060's ~ 180 ml/min

Controller #s used are logged on the canister sample log. Tagged flow rates were recorded in the lab notebook for the [ ] and not recorded for the [Ex. 5 Deliberative Process (DP)].

**From:** Long, Thomas

**Sent:** Friday, July 26, 2019 12:13 PM

**To:** Snow, Richard <Snow.Richard@epa.gov>; Faircloth, James <Faircloth.James@epa.gov>

**Subject:** FW: [Ex. 4 CBI] data review

Richard,

Would you have a chance to look up the nominal flow of the controllers for each of the sample periods asked about below (505s, 1372s, 1060s)? Where do we have that logged?

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

**From:** Hoyer, Marion

**Sent:** Friday, July 26, 2019 11:58 AM

**To:** Long, Thomas <Long.Thomas@epa.gov>

**Cc:** Walters, Charles <walters.charles@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>

**Subject:** FW: [Ex. 4 CBI] data review

Hi Tom,

Here are the questions Chuck has. Thanks for letting us know your thoughts.  
 Marion

**From:** Walters, Charles

**Sent:** Thursday, July 25, 2019 10:54 AM

**To:** Cullen, Angela <cullen.angela@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>

**Subject:** [Ex. 4 CBI] data review

All,

I reviewed the dyno data and Enthalpy report for the [ ]. Since there are concerns with the EtO analysis; I only focused on canister sample collection and CO2 agreement. Here are my observations.

- The uncorrected bag CO2 vs canister CO2 agreed within 3% (see yellow areas in spreadsheet). This is significantly better than the [ ] testing. I noticed that the vacuum decay in the canister was considerably smaller than the testing done on the [ ]. The [ ] final Pratos averaged 0.549; which is very near the 0.528 theoretical choked



flow Pratio limit for an orifice. This would result in a more constant sample flow over the test phase providing a more representative sample over the phase. This could explain the better CO2 agreement in the [Ex. 5 Deliberative Process (DP)] testing.

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#### **Proposed questions to Enthalpy and/or ORD**

Below are proposed questions to Enthalpy. These questions are designed to get a better understanding of the before and after state of the sample flow and perhaps influence the controller flow selected for the sample period. I know that this method is still considered qualitative; however, if it transitions to quantitative we will need a better handle on the sample flow and proportionality. I’m not sure if now is the right time to be asking these questions nor do I have a read on cost impacts in asking these questions. We should discuss.

- Is “initial flow” vs “return flow” available for the [ ] (similar to the data presented on page 89 of the [ ] report)?
- Can the “initial flow” vs “return flow” data be included in the report for any future testing?
- Is “return flow” measured at the “as received” canister vacuum?
- What nominal flow rate is selected for each sample period? 505s, 1372s, 1060s
- What nominal flow rate options are available?

Thanks,  
Chuck

Message

---

**From:** Laroo, Chris [laroo.chris@epa.gov]  
**Sent:** 11/26/2019 6:08:14 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Cullen, Angela [cullen.angela@epa.gov]  
**Subject:** RE: Missing Test Cell Data for EtO

**Flag:** Follow up

Tom,

No worries. That was exactly what I needed. Thank you!!

Regards,

Chris Laroo  
Environmental Protection Specialist  
US Environmental Protection Agency  
Office of Transportation and Air Quality  
Assessment and Standards Division  
2000 Traverwood Dr.  
Ann Arbor, MI 48105  
(734) 214-4937  
(734) 214-4055 (fax)  
Email: laroo.chris@epa.gov

---

**From:** Long, Thomas <Long.Thomas@epa.gov>  
**Sent:** Tuesday, November 26, 2019 1:05 PM  
**To:** Laroo, Chris <laroo.chris@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: Missing Test Cell Data for EtO

Sorry for the delay.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Laroo, Chris <laroo.chris@epa.gov>  
**Sent:** Tuesday, November 26, 2019 10:53 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: Missing Test Cell Data for EtO

Tom,

Thanks. The [REDACTED] data you sent is exactly what I needed. That just leave the [REDACTED]

Regards,

Chris Laroo  
Environmental Protection Specialist  
US Environmental Protection Agency  
Office of Transportation and Air Quality  
Assessment and Standards Division  
2000 Traverwood Dr.  
Ann Arbor, MI 48105  
(734) 214-4937  
(734) 214-4055 (fax)  
Email: laroo.chris@epa.gov

---

**From:** Long, Thomas <Long.Thomas@epa.gov>  
**Sent:** Tuesday, November 26, 2019 9:49 AM  
**To:** Laroo, Chris <laroo.chris@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** RE: Missing Test Cell Data for EtO

I thought I had updated the [REDACTED] spreadsheet. I'll need to go back and look. I'll try to do that this afternoon. But here is the [REDACTED] data.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Laroo, Chris <laroo.chris@epa.gov>  
**Sent:** Tuesday, November 26, 2019 9:00 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>  
**Subject:** Missing Test Cell Data for EtO

Tom,

Just wondering if you could please provide me with the missing test cell data I need to process all of the EtO emission results. I am missing vmix and miles driven over the duty-cycle for the [REDACTED] testing and I need all of the emission results for the second round of testing for the [REDACTED]. Any help is appreciate. Thanks.

Regards,

Chris Laroo  
Environmental Protection Specialist  
US Environmental Protection Agency  
Office of Transportation and Air Quality  
Assessment and Standards Division  
2000 Traverwood Dr.  
Ann Arbor, MI 48105  
(734) 214-4937  
(734) 214-4055 (fax)  
Email: laroo.chris@epa.gov



## Message

**From:** Snow, Richard [Snow.Richard@epa.gov]  
**Sent:** 7/9/2019 4:02:41 PM  
**To:** Long, Thomas [Long.Thomas@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]  
**Subject:** RE: F150 E10 Data

**Flag:** Follow up

Chris and Tom,

We used  $\alpha = 2.0293$ ,  $\beta = 0.0388$ , which is a close approximation of what we expect our Tier 3 fuel to be (actual fuel analysis is pending).

-Richard

---

**From:** Long, Thomas  
**Sent:** Monday, July 08, 2019 10:42 AM  
**To:** Laroo, Chris <laroo.chris@epa.gov>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>  
**Subject:** RE: F150 E10 Data

Today is Snow's CDO, but he will get back to us with those values.

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

---

**From:** Laroo, Chris  
**Sent:** Monday, July 08, 2019 9:46 AM  
**To:** Long, Thomas <Long.Thomas@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>  
**Subject:** RE: F150 E10 Data

Tom,

For the ☐, did you use the 1065 default  $\alpha$  and  $\beta$  values for the fuel when determining DF or actual values. If the latter, can you please send the  $\alpha$  and  $\beta$  values. Thanks.

Regards,

Chris Laroo  
 Environmental Protection Specialist  
 US Environmental Protection Agency  
 Office of Transportation and Air Quality  
 Assessment and Standards Division  
 2000 Traverwood Dr.  
 Ann Arbor, MI 48105

(734) 214-4937  
(734) 214-4055 (fax)  
Email: laroo.chris@epa.gov

---

**From:** Long, Thomas  
**Sent:** Wednesday, June 19, 2019 1:37 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>  
**Subject:** RE: [REDACTED] E10 Data

Chris,

Here is the df and concentration data you requested.

Marion,

We'll have a truck quote ASAP.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Long, Thomas  
**Sent:** Tuesday, June 18, 2019 2:34 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; McDonald, Joseph <mcdonald.joseph@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>  
**Subject:** [REDACTED] E10 Data

Please find attached:

1. Initial regulated emission data from the [REDACTED] E10
2. COC and can pressure log examples [REDACTED]
3. QAPP for EtO (an addendum to our dyno QAPP)

Let me know if there is any other information you would find helpful.

I wanted to correct an earlier email. The main dyno QAPP is Category B and the EtO addendum is Category A.

Due to vacation schedules it has been necessary to revamp my expectations with regard to test dates. We can discuss this further tomorrow. Here is my current plan:

Phase 1 (Complete-Funding received)  
Source: [REDACTED] 2.7L GDI  
Fuel: CERT 3 ETIO  
Lab: Light-duty dynamometer facility  
Sampling days: 3

Driving schedule: FTP75

Sources: Phase 1 cold start and composite of Phase 2 stabilized with Phase 3 hot start

Phase 2 (June 5-12, Sampling Complete)

Vehicle: Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) -6 6.7L, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There was both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both were tested on each of the 3 days of testing. Each day there was a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans was spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked = 15 total

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

Phase 3 (July 8-12)

Vehicle: MY2013 sequential PFI Ex. 5 Deliberative Process (DP)

Fuel: Tier 3 E10 cert fuel

Lab: Light-duty dynamometer facility.

Sampling days: 3

Driving schedules: FTP75 and Supplemental FTP.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting spare).

Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds

- 3 controllers set for 505 seconds.
- 10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)
- 9 controllers set for 596 seconds (3 source, 6 background)
- The blank and the outdoor ambient sample do not require controllers.

## Summary:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.
- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

## Phase 4 (July 24-28)

Vehicle: Turbocharged GDI  (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel (ethanol free) or market E0 fuel

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

## Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24 (25 counting the spare).

## Controllers required:

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

## Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@505 seconds.



- 1 controller/can for each of two days for stabilized, source, 2@1372 seconds
- x2 controllers/cans for stabilized/spiked for the third day, source, 2@1372 seconds
- x1 controller/can per each of three days for source, US06, 3@596 seconds.
- 2 controllers/cans for background ambient per each of three days, 6@1372 seconds
- 2 controllers/cans per each of three days for background ambient for 6@596 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Phase 5 (August 12-16)

Vehicle: Gasoline heavy-duty truck

Fuel: TBD.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 5 – 6 source, 7 ambient, 1 blank, 1 spiked = 15 total (not including spare)

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

#### Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@1060 seconds.
- 1 controller/can for each of three days for warm start HD-UDDS, source, 3@1060 seconds
- 1 controllers/cans for stabilized/spiked for the third day, source, 1@1060 seconds
- 2 controllers/cans for background ambient per each of three days, 6@1060 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

#### Phase 6 (Date TBD)

Vehicle: Class 8 HDDT per study with James Sanchez

Fuel: ULSD.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

This program includes the EtO sampling of the truck used in a separate study. There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot-start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 6 – 6 source, 7 ambient, 1 blank, 1 spiked = 15 total (not including spare)

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

Summary of cans and controllers:

- 1 controller/can per each of three days for cold start, source, 3@1060 seconds.
- 1 controller/can for each of three days for warm start HD-UDDS, source, 3@1060 seconds
- 1 controllers/cans for stabilized/spiked for the third day, source, 1@1060 seconds
- 2 controllers/cans for background ambient per each of three days, 6@1060 seconds
- 1 can for outside background
- 1 can for blank
- 1 spare

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

Appointment

---

**From:** Cook, Rich [Cook.Rich@epa.gov]  
**Sent:** 3/4/2019 9:39:03 PM  
**To:** Cook, Rich [Cook.Rich@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Hays, Michael [Hays.Michael@epa.gov]; George, Ingrid [George.Ingrid@epa.gov]; Hoyer, Marion [Hoyer.Marion@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]  
**CC:** Nelson, Brian [nelson.brian@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]; Sargeant, Kathryn [sargeant.kathryn@epa.gov]  
**Subject:** EtO Testing  
**Location:** AA-Room-Office-C34-ConfRoom/AA-OTAQ-OFFICE, **Ex. 6 Personal Privacy (PP)**  
**Start:** 3/19/2019 6:00:00 PM  
**End:** 3/19/2019 7:00:00 PM  
**Show Time As:** Busy

**Required Attendees:** Long, Thomas; Hays, Michael; George, Ingrid; Marion Hoyer; Geidosch, Justine; Laroo, Chris; Cullen, Angela  
**Optional Attendees:** Nelson, Brian; Olechiw, Michael; Shores, Richard; Sargeant, Kathryn

The purpose of this meeting is what NRMRL might be able to do to help with the mobile source EtO characterization issue.

## Agenda items:

- 1) What kind of short term testing to identify presence of EtO is possible at RTP?
- 2) What vehicles are available for testing? Any post-2010 diesels or non-GDI LDGVs?
- 3) Timeframe
- 4) Likely cost
- 5) Longer term EtO testing needs

Message

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**From:** Kariher, Peter [Kariher.Peter@epa.gov]  
**Sent:** 7/26/2019 6:54:02 PM  
**To:** Nessley, Libby [Nessley.Libby@epa.gov]  
**Subject:** FW: Spiked EtO cans  
**Attachments:** SpikedCans.xlsx

This sounds reasonable. Take a look.

Peter

---

**From:** Long, Thomas  
**Sent:** Friday, July 26, 2019 2:19 PM  
**To:** Kariher, Peter <Kariher.Peter@epa.gov>  
**Cc:** Snow, Richard <Snow.Richard@epa.gov>  
**Subject:** FW: Spiked EtO cans

Peter,

I have been working feverishly since our telecon to review the impact of a difference in can volume. Please find the calculations I carefully put together in this spreadsheet. Snow had absolutely nothing to do with this. It was all me. (Please ignore the email chain below.)

Seriously, if you see where there is a better way of looking at this please let us know. Thanks.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Snow, Richard  
**Sent:** Friday, July 26, 2019 1:30 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Subject:** RE: Spiked EtO cans

Just a volume correction

---

**From:** Long, Thomas  
**Sent:** Friday, July 26, 2019 1:26 PM  
**To:** Snow, Richard <[Snow.Richard@epa.gov](mailto:Snow.Richard@epa.gov)>  
**Subject:** RE: Spiked EtO cans

Your calculations didn't come through with the email.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02

Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Snow, Richard  
**Sent:** Friday, July 26, 2019 1:25 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>; Faircloth, James <[Faircloth.James@epa.gov](mailto:Faircloth.James@epa.gov)>  
**Cc:** Kariher, Peter <[Kariher.Peter@epa.gov](mailto:Kariher.Peter@epa.gov)>  
**Subject:** Spiked EtO cans

Based on the EtO discussion this morning, james and I come up with recalculated recoveries of 77% and 129% on the Ex. 5 Deliberative Process (DP) cans, respectively.

**Richard Snow** | Engineering Technician  
U.S. Environmental Protection Agency/ORD/NRMRL/AEMD/DSBB  
109 T.W. Alexander Drive, Mail Drop E343-02  
RTP, NC 27711

Office 919.541.3135 | Cell 919.621.5852  
[Snow.Richard@EPA.gov](mailto:Snow.Richard@EPA.gov)

Message

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**From:** Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]  
**Sent:** 7/31/2019 1:18:03 PM  
**To:** Nessley, Libby [Nessley.Libby@epa.gov]  
**Subject:** FW: TO15 and Enthalpy methods applied to mobile sources  
**Attachments:** 190726\_Questions.docx

Hey Libby,

I just wanted you to have these questions that the OTAQ chemist had in regards to the TO15 analysis from Enthalpy on the F750. We are discussing these bullet points/questions on our standing call with OTAQ on EtO, but Tom is out of the office, so he might not have seen this yet to share with you.

Best,  
Tiffany

---

*Tiffany L. B. Yelverton, Ph.D.*

Mechanical Engineer  
Stationary Source Branch  
Office of Research & Development  
U. S. Environmental Protection Agency  
109 T. W. Alexander Drive (E305-01)  
Research Triangle Park, NC 27711

919.541.9456 (office)  
919.541.0554 (fax)

---

**From:** Loftis, Kathy <loftis.kathy@epa.gov>  
**Sent:** Tuesday, July 30, 2019 8:38 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; George, Ingrid <George.Ingrid@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>; Yelverton, Tiffany <Yelverton.Tiffany@epa.gov>; Shappley, Ned <Shappley.Ned@epa.gov>; Kariher, Peter <Kariher.Peter@epa.gov>; Chen, Xi <Chen.Xi@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>; Weinstock, Lewis <Weinstock.Lewis@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Dewees, Jason <Dewees.Jason@epa.gov>  
**Subject:** RE: TO15 and Enthalpy methods applied to mobile sources

I'm attaching a list of questions that I have, to which you may already have answers. This may offer a starting point for tomorrow's conversation.

-----Original Appointment-----

**From:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Sent:** Wednesday, July 24, 2019 10:43 AM  
**To:** Hoyer, Marion; George, Ingrid; Loftis, Kathy; Kolowich, Bruce; Yelverton, Tiffany; Shappley, Ned; Kariher, Peter; Chen, Xi; Cullen, Angela; Cook, Rich; Laroo, Chris; Shores, Richard; Weinstock, Lewis; Walters, Charles; Long, Thomas  
**Cc:** Dewees, Jason

**Subject:** TO15 and Enthalpy methods applied to mobile sources

**When:** Wednesday, July 31, 2019 9:00 AM-10:00 AM (UTC-05:00) Eastern Time (US & Canada).

**Where:** AA-Room-Office-C35-ConfRoom/AA-OTAQ-OFFICE

Let's use this callin number:

## Ex. 6 Personal Privacy (PP)

This meeting is in regard to the email I sent below:

**From:** Hoyer, Marion

**Sent:** Wednesday, July 24, 2019 10:29 AM

**Subject:** FW:  EtO Results

Hi All,

With the latest round of analyses on motor vehicle exhaust EtO from Enthalpy in hand, we are interested in getting in touch, first to talk about the TO15 analytical approach and results from Enthalpy's analysis in a more detailed way.

Kat is putting together a set of questions that might be something that those of you who are familiar with Enthalpy's work could help address. We are thinking there might be additional questions that we'll want to ask Enthalpy, but it makes sense to start internally first.

Kat will send the questions we have and possibly we can iterate by email, but I'll look for a time for us to talk too.

Thanks,  
Marion

Message

---

**From:** Cook, Rich [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0533CECF88EC45A986FF4D593F1C0737-COOK, RICH]  
**Sent:** 4/8/2019 4:53:34 PM  
**To:** Marion Hoyer [Hoyer.Marion@epa.gov]  
**Subject:** FW: Enthalpy EO Quote  
**Attachments:** enthalpy TO-15 list final press.pdf

I know we were hoping they would do the PR. Not sure how they justified sole source before. Could ask Tiffany if we have to do it I guess.

Rich Cook  
Health Effects, Benefits, and Air Toxics Center  
Assessment and Standards Division  
Office of Transportation and Air Quality  
U. S. Environmental Protection Agency  
(734)214-4827

---

**From:** Long, Thomas  
**Sent:** Monday, April 08, 2019 12:48 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>  
**Cc:** Shores, Richard <Shores.Richard@epa.gov>  
**Subject:** FW: Enthalpy EO Quote

Marion,

I am attaching the response from Enthalpy. My understanding is that you will provide them the PR and funding. Please let me know when the deal is in place and we can expect to receive the cans/controllers. We're looking forward to supporting this project at RTP. Thanks for answering all of my questions leading up this point.

---

Thomas Long, Mechanical Engineer  
Mail Drop E343-02  
Building D Room 360  
109 T. W. Alexander Drive  
Research Triangle Park, NC 27711  
Phone: 919-541-3944

---

**From:** Bryan Tyler <[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)>  
**Sent:** Monday, April 08, 2019 12:04 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Thorne Gregory <[thorne.gregory@enthalpy.com](mailto:thorne.gregory@enthalpy.com)>  
**Subject:** Enthalpy EO Quote

Dear Thomas,

As discussed you would like to engage Enthalpy Analytical (Durham, NC) in the analysis of combustion gas for Ethylene oxide, TO-15 and EPA Method 3C, previously performed on Enthalpy project # 0219-074). Samples will be collected into individually blank checks 6L Silco/Silonite lined sampling canisters. Samples will be returned to our lab and analyzed by GC/MS operating in the Selective Ion Mode.



We anticipate analyzing approximately 15 canisters collected from active combustion sources at a significant dilution with an expected reporting limit (RL) of 10ppb. After all samples have been analyzed at the first dilution (10 ppb RL), if samples do not have detectable concentrations of ethylene oxide, 1 sample per condition will be chosen and we will attempt to reanalyze these samples at a reduced dilution. The reduced dilution will result in a reduced RL. Samples will be introduced to the instrument at successively lower dilutions until the results have questionable validity from smearing/overloading the instrument with other inseparable species (like high CO/CO<sub>2</sub>, combustion products) or instrument operational viability becomes compromised.

Reactive compounds can damage the instrument and trapping system and this is usually observed by instrument noise increasing significantly or instrument response reduction. Instrument response reductions of greater than 30%, as quantified by internal standard abundances, indicate the system may be compromised. We will not attempt to reduce detection limits below 0.1ppb due to the risks involved in pushing the instrumentation past that level are significant.

In addition to the Ethylene oxide analysis we will also analyze the same canister for the TO-15 target compound list with a 10 ppb reporting limit and by EPA Method 3C (O<sub>2</sub>, CO<sub>2</sub>, Methane, CO) with a 0.10% reporting limit. See attached TO-15 target compound list.

## Ex. 4 CBI

Please let me know ASAP if you will be moving forward with this project.

Kind Regards,  
Bryan

*Please take a moment to provide [customer feedback](#).*



**Bryan Tyler**  
Vice President  
Enthalpy Analytical, LLC  
800 Capitola Drive, Suite 1  
Durham, NC 27713  
(919) 850-4392  
[bryan.tyler@enthalpy.com](mailto:bryan.tyler@enthalpy.com)  
[www.enthalpy.com](http://www.enthalpy.com)

[Terms and Conditions](#)  
[Enthalpy Sample Acceptance Policy](#)

SSAS Laboratory ID: L0036, L0149 (metals only)

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you are not the intended recipient, you are hereby notified that any disclosure, use, dissemination, copying, or storage of this message or its attachments is strictly prohibited.

## Message

**From:** Cook, Rich [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0533CECF88EC45A986FF4D593F1C0737-COOK, RICH]  
**Sent:** 10/4/2019 8:34:25 PM  
**To:** Mo, Tiffany (Na) [mo.na@epa.gov]  
**Subject:** FW: Yesterday's EtO Meeting -- Update

---

**From:** Cook, Rich  
**Sent:** Thursday, October 03, 2019 10:45 AM  
**To:** Marion Hoyer <Hoyer.Marion@epa.gov>  
**Cc:** Richard Baldauf <Baldauf.Richard@epa.gov>  
**Subject:** Yesterday's EtO Meeting -- Update

A few updates:

- 1) Because the dyno facility will be shut down for a month at end of October for upgrades, the next round will be retesting of the [redacted] which has a UPF and SCR, but not an OC). Testing will begin Oct. 21. Will include pre-exhaust and tailpipe, direct and diluted exhaust. Will include a transient cycle to get data under rich and lean conditions, since we do not understand mechanism of formation in diesels (Faircloth thinks it is because diesels do not run as close to stoichiometric conditions).
- 2) Tiffany suggested spiking canister with compounds that may cause interference (e.g. acetaldehyde and trans-2-butene).
- 3) Tony suggested maybe a cold idle – this was to be discussed offline.
- 4) Tiffany just had a new instrument delivered, which uses an FTIR-based method. She has also ordered an Aerodyne cavity ringdown system (whatever that is). Two more mid-IR systems also are being evaluated. The plan is to have an instrument challenge.
- 5) OTAQ-TATD work – Kat thinks there may be issue of EtO stability in canisters because of less than 100% sample recovery. She plans to do controlled recovery testing. Also plans to do in-line measurement as well as summa canisters to address proportionality issues. TATD gearing up to test small engines.
- 6) Communication – OAQPS says monitor data will be released in less than two weeks. They anticipate significant media attention. The message they would like is that while they confidence in ambient measurements, it is more challenging to do source measurement. We are currently testing methods to evaluate combustion emissions, cannot draw conclusions about mobile source measurements.
- 7) There will be a separate meeting on proportionality methods.
- 8) Angela is developing a spreadsheet matrix with questions we have, along with resolution and/or future actions.
- 9) As I mentioned yesterday, [redacted] set aside for EtO work is going to dyno along with TO-15 work by Ingrid George. Funding is less than half requested.

Message

---

**From:** Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]  
**Sent:** 4/4/2019 1:08:37 PM  
**To:** Cook, Rich [Cook.Rich@epa.gov]  
**CC:** Hoyer, Marion [hoyer.marion@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]  
**Subject:** Re: Check In -- EtO Testing

Hey Rich,

Thanks for letting me know. I'll do my best to call in today. I hope Tom is able to convince Enthalpy to run the samples, but I haven't had luck with convincing them otherwise.

Best.  
Tiffany

Sent from my iPhone

On Apr 4, 2019, at 8:42 AM, Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)> wrote:

I was talking to Richard Shores yesterday and he said Tom Long has been having extensive conversations with Enthalpy, and they will bring us up to date.

Tom has pointed out to Enthalpy that the controlled engines we will be testing emit far less NO than the genset so plugging up the column will be less of an issue.

We also have some money to help cover down time if that is an issue.

In addition, there are other options and I think it will be good to discuss those.

So I do think a discussion will be useful.

Rich Cook  
Health Effects, Benefits, and Air Toxics Center  
Assessment and Standards Division  
Office of Transportation and Air Quality  
U. S. Environmental Protection Agency  
(734)214-4827

---

**From:** Yelverton, Tiffany  
**Sent:** Thursday, April 04, 2019 8:39 AM  
**To:** Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>  
**Subject:** RE: Check In -- EtO Testing

Hey Rich,

Is this call necessary given our discussion yesterday? Or is this a discussion to go in a different direction?

Best,  
Tiffany

-----Original Appointment-----

**From:** Cook, Rich

**Sent:** Wednesday, March 20, 2019 1:28 PM

**To:** Cook, Rich; Long, Thomas; Hays, Michael; George, Ingrid; Hoyer, Marion; Geidosch, Justine; Laroo, Chris; Cullen, Angela; Nelson, Brian; Shores, Richard; Yelverton, Tiffany; Olechiw, Michael

**Cc:** Weinstock, Lewis

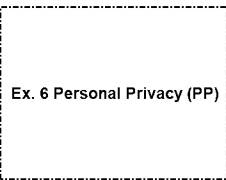
**Subject:** Check In -- EtO Testing

**When:** Thursday, April 04, 2019 12:30 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).

**Where:** AA-Room-Office-C34-ConfRoom/AA-OTAQ-OFFICE

OK trying this again!

Sorry I could not find a time that works for everyone.



Message

---

**From:** McDonald, Joseph [McDonald.Joseph@epa.gov]  
**Sent:** 6/10/2019 7:28:04 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]  
**CC:** Bryson, James [bryson.james@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]  
**Subject:** Re: Notes from Trip to RTP on EtO Testing

# Ex. 5 Deliberative Process (DP)

Joe

Joseph McDonald  
Senior Engineer

U.S. EPA  
ORD/NRMRL & OAR/OT&Q  
Mail Stop: 236  
26 W. Martin Luther King Dr.

Cincinnati, Ohio 45268 USA

Telephone (USA): 513-569-7421

Cellular Telephone: 513-316-2380

E-mail: mcdonald.joseph@epa.gov

On Jun 10, 2019, at 2:35 PM, Cullen, Angela <cullen.angela@epa.gov> wrote:

From: Christopher Laroo <chris\_laroo@yahoo.com>

Sent: Thursday, June 06, 2019 7:32 AM

To: Cullen, Angela <cullen.angela@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>

Subject: Notes from Trip to RTP on EtO Testing

Marion and Angela,

I have been having issues connecting my personal computer to the VPN since the latest securing update, so I am sending this from my personal address and I thought you might want a readout from yesterday's trip to RTP prior to my returning to the office on Monday.

The sampling setup is relatively easy to incorporate into any of our test sites. They use a 6 L passivated, precleaned canister supplied by Enthalpy. Enthalpy also supplies a flow controller that consists of a passivated sample pathway that included a vacuum gauge and a venturi to ensure constant sample flow into the canister. The controller sample pathway is about 8 inches in total length. The controller flow is customized (within the range of available off the shelf venturi flow rates) for the duration of the test interval the sample is being drawn from. The flow rate is designed to maximize sample flow while ensuring that the vacuum is not totally drawn down over the test. For example the flow controller flow rate for Ph1 of the vehicle FTP is different than the one for a combined Ph2 and Ph3 (505s for Ph1 vs 1362 for Ph2/3). Initially they had Enthalpy supply a single control for each flow setting for a given suite of tests, meaning that they would reuse, for example, the Ph1 controller for all Ph1 testing on the [REDACTED]. They have modified the contract with Enthalpy so that for future testing the controllers are single use, thus they will supply one per test. Their concern is contamination, but realistically I doubt there is an influence from reuse based on the test results we have seen from the [REDACTED].

We observed the test on the [REDACTED]. Angela, I did not get a picture of the emission label as the hood was down for testing and the test site was very busy. Tom said to follow-up with him and he will get you one. They don't attach the canister sample line to the controller or the controller to the canister until just prior to the start of the test. Everything is capped. About 10 minutes prior, they attach the controller to the canister and leave the upstream end capped. They then manually open the valve to perform a combined vacuum and leak check. The vacuum value is recorded. About 5 minutes prior the start of the test, they attached the upstream end of the controller to the sample line/probe. The sample/line probe is designed to be as short as possible. I would estimate that it is 18" long. It is 1/4 316 SS passivated with Restek's silcosteel passivation technology. The material is off the shelf supplied by Restek. Any Swagloc connectors are also passivated and supplied by Restek, but those are all a part of the controller supplied by Enthalpy. Their probe enters perpendicular to the flow in the tunnel and makes a 90 degree bend to face upstream. The probe is never removed. It protrudes 4" into the sample stream from the wall on an 18" diameter tunnel.

The driver honks the horn at the start of the test and the technician manually opens the valve on the canister to begin sampling. I don't think there is a way to automate it. The same occurs at the end of the test interval and the valve is closed. I can write up a detailed procedure to follow when I am in the office next week.

Based on what I observed, I believe that NRMRL is executing sound tests. I saw nothing of major concern.

We spent time talking to Ingrid on her method development and she is a long way off and really needs new equipment to get lower DLs. I suspect from now into the future, any analysis will need to be contracted out the Enthalpy.

I spent a lot of time talking to Kat as we had time to kill in the airport after the meeting. She is a very skilled chromatographer with a LOT of experience. I think it would be beneficial to send her the 400+ page report from Enthalpy on the [REDACTED] along with the results summarized in the Excel file as I believe she will be able to determine if there is any potential for coelution of other analytes with EtO in Enthalpy's analytical method. I also believe that given the right resources (equipment) she could establish a method in our lab.

Let me know if you have any other questions for now. Photos are attached.

Chris

<image2.jpeg>

<image3.jpeg>

<image4.jpeg>



## Message

**From:** Cullen, Angela [cullen.angela@epa.gov]  
**Sent:** 6/10/2019 6:35:33 PM  
**To:** Bryson, James [bryson.james@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; McDonald, Joseph [McDonald.Joseph@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]  
**Subject:** FW: Notes from Trip to RTP on EtO Testing  
**Attachments:** image2.jpeg; image3.jpeg; image4.jpeg

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**From:** Christopher Laroo <chris\_laroo@yahoo.com>  
**Sent:** Thursday, June 06, 2019 7:32 AM  
**To:** Cullen, Angela <cullen.angela@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>  
**Subject:** Notes from Trip to RTP on EtO Testing

Marion and Angela,

I have been having issues connecting my personal computer to the VPN since the latest securing update, so I am sending this from my personal address and I thought you might want a readout from yesterday's trip to RTP prior to my returning to the office on Monday.

The sampling setup is relatively easy to incorporate into the any of our test sites. They use a 6 L passivated, precleaned canister supplied by Enthalpy. Enthalpy also supplies a flow controller that consists of a passivated sample pathway that included a vacuum gauge and a venturi to ensure constant sample flow into the canister. The controller sample pathway is about 8 inches in total length. The controller flow is customized (within the range of available off the shelf venturi flow rates) for the duration of the test interval the sample is being drawn from. The flow rate is designed to maximize sample flow while ensuring that the vacuum is not totally drawn down over the test. For example the flow controller flow rate for Ph1 of the vehicle FTP is different than the one for a combined Ph2 and Ph3 (505s for Ph1 vs 1362 for Ph2/3). Initially they had Enthalpy supply a single control for each flow setting for a given suite of tests, meaning that they would reuse, for example, the Ph1 controller for all Ph1 testing on the [REDACTED]. They have modified the contract with Enthalpy so that for future testing the controllers are single use, thus they will supply one per test. Their concern is contamination, but realistically I doubt there is an influence from reuse based on the test results we have seen from the [REDACTED].

We observed the test on the [REDACTED]. Angela, I did not get a picture of the emission label as the hood was down for testing and the test site was very busy. Tom said to follow-up with him and he will get you one. They don't attached the canister sample line to the controller or the controller to the canister until just prior to the start of the test. Everything is capped. About 10 minutes prior, they attach the controller to the canister and leave the upstream end capped. They then manually open the valve to perform a combined vacuum and leak check. The vacuum value is recorded. About 5 minutes prior the start of the test, they attached the upstream end of the controller to the sample line/probe. The sample/line probe is designed to be as short as possible. I would estimate that it is 18" long. It is 1/4

316 SS passivated with Restek's silcosteel passivation technology. The material is off the shelf supplied by Restek. Any Swagloc connectors are also passivated and supplied by Restek, but those are all a part of the controller supplied by Enthalpy. Their probe enters perpendicular to the flow in the tunnel and makes a 90 degree bend to face upstream. The probe is never removed. It protrudes 4" into the sample stream from the wall on an 18" diameter tunnel.

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Based on what I observed, I believe that NRMRL is executing sound tests. I saw nothing of major concern.

We spent time talking to Ingrid on her method development and she is a long way off and really needs new equipment to get lower DLs. I suspect from now into the future, any analysis will need to be contracted out the Enthalpy.

I spent a lot of time talking to Kat as we had time to kill in the airport after the meeting. She is a very skilled chromatographer with a LOT of experience. I think it would be beneficial to send her the 400+ page report from Enthalpy on the [REDACTED] along with the results summarized in the Excel file as I believe she will be able to determine if there is any potential for coelution of other analytes with EtO in Enthalpy's analytical method. I also believe that given the right resources (equipment) she could establish a method in our lab.

Let me know if you have any other questions for now. Photos are attached.

Chris

Appointment

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**Sent:** 10/8/2019 7:09:31 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]  
**BCC:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE [AA-Room-Office-C147-ConfRoom@epa.gov]  
**Subject:** Follow-up Discussion on EtO Coordination  
**Location:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE  
**Start:** 10/16/2019 1:00:00 PM  
**End:** 10/16/2019 1:30:00 PM  
**Show Time As:** Busy

## Ex. 6 Personal Privacy (PP)

### Tentative Agenda:

- Next phases of ORD testing

Appointment

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**From:** Cullen, Angela [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FF1B7C0675434915BADE463AD4619509-CULLEN, ANGELA]  
**Sent:** 10/8/2019 7:15:59 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]  
**CC:** Hoyer, Marion [hoyer.marion@epa.gov]  
**BCC:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE [AA-Room-Office-C147-ConfRoom@epa.gov]  
**Subject:** Follow-up Discussion on EtO Coordination  
**Location:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE  
**Start:** 10/16/2019 1:00:00 PM  
**End:** 10/16/2019 1:30:00 PM  
**Show Time As:** Busy

**Required Attendees:** Long, Thomas; Loftis, Kathy; Walters, Charles; Cook, Rich; Fernandez, Antonio; Laroo, Chris  
**Optional Attendees:** Hoyer, Marion

## Ex. 6 Personal Privacy (PP)

**Tentative Agenda:**

- Next phases of ORD testing
- Any data gaps from previous phases
- Proportionality discussion – concerns, data or questions for Enthalpy, plans to address
- Ability to obtain summa canisters from Enthalpy for nonroad testing at OTAQ

Appointment

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**From:** Charmley, William [charmley.william@epa.gov]  
**Sent:** 6/3/2019 6:27:14 PM  
**To:** Charmley, William [charmley.william@epa.gov]; Sargeant, Kathryn [sargeant.kathryn@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Haugen, David [haugen.david@epa.gov]  
**CC:** Brusstar, Matt [brusstar.matt@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Olechiw, Michael [olechiw.michael@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; McDonald, Joseph [McDonald.Joseph@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]

**Subject:** EtO Testing Status Update (Ex. 6 Personal Privacy (PP))  
**Location:** N158

**Start:** 7/30/2019 7:05:00 PM  
**End:** 7/30/2019 7:55:00 PM  
**Show Time As:** Busy

**Required Attendees:** Kathryn Sargeant (sargeant.kathryn@epa.gov); Hoyer, Marion; Cullen, Angela; Haugen, David  
**Optional Attendees:** Brusstar, Matt; Walters, Charles; Kolowich, Bruce; Nelson, Brian; Michael Olechiw (olechiw.michael@epa.gov); Cook, Rich; Loftis, Kathy; Fernandez, Antonio; McDonald, Joseph; Laroo, Chris; Shores, Richard

## Message

**From:** Storhok, Ines [storhok.ines@epa.gov]  
**Sent:** 6/17/2019 11:52:43 AM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]  
**CC:** Cullen, Angela [cullen.angela@epa.gov]; Sargeant, Kathryn [sargeant.kathryn@epa.gov]  
**Subject:** RE: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21

Forgot to mention, that the request will go to Haley to present to SLT, so TATD will be part of the discussion.

At this point, I'm going to let the discussions at the SLT happen and let them coordinate as needed. The reserve funds are coming from the same OTAQ pot.

Thanks,

Ines

---

**From:** Storhok, Ines  
**Sent:** Monday, June 17, 2019 7:51 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>  
**Subject:** RE: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21

Marion – thanks for the updated figure.

I'm sending to Haley this morning, as it was due on Friday. I was out on Friday, so I'm sending now.

Thanks,

Ines

---

**From:** Hoyer, Marion  
**Sent:** Friday, June 14, 2019 4:03 PM  
**To:** Storhok, Ines <storhok.ines@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>  
**Subject:** RE: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21

I talked with our ORD colleagues today and they need an additional Ex. 4 CBI to take them through the end of September during which time they will test at least 3 LDGVs and 2 HDDT and two fuels to evaluate a potential influence of ethanol on emissions of ethylene oxide.

## Ex. 4 CBI

If everyone else is OK with the proposal, I have no further edits and I don't have anything to add on potential TATD funding needs.

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, June 12, 2019 8:07 AM  
**To:** Storhok, Ines <storhok.ines@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>  
**Subject:** RE: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21

Hi Ines,

Here is a draft write-up. I am waiting for input from ORD to find out how far into this FY the Ex. 4 CBI ASD has provided so far will last for the LDGV and HDDT testing and analysis that they are funding (they are more than matching our expenditure currently).

I am wondering if we need to provide this request as a joint ASD-TATD request? TATD has started investing in analysis method development and they are going to be bringing a new sample collection method on-line and then begin nonroad testing.

**Request:** The emissions of ethylene oxide, currently the most significant driver for cancer risk in ambient air, has emerged in 2019 as an urgent issue that OTAQ is facing. Initial data suggests that at least LDGV may be emitting this highly carcinogenic compound and without delay, OTAQ needs to be generating emissions data to understand how wide-spread this issue might be among mobile sources and to understand the mechanisms of formation in order to identify mitigation measures.

The near-term activities for which ASD requires funding are focused on 1) collecting and analyzing exhaust samples from two LDGVs and two HDDVs in the ORD-NRMRL lab, and 2) developing capability for ORD to analyze mobile source exhaust in-house to expedite a larger volume of emissions test and lower future analysis costs into FY20. The outputs of this work will provide information on whether diesel exhaust contains ethylene oxide and provide information on how widespread the LDGV emissions of ethylene oxide are among different on-road technologies.

**Ex. 4 CBI**

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**From:** Storhok, Ines  
**Sent:** Wednesday, June 12, 2019 7:04 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** Fwd: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21

Marion:

See Haley's request below to all Divisions. Our request for the Ex. 4 CBI prompted this process with the SLT.

Can you summarize the request for the \$260k based on Haley's email below (see underlined text below)? Even though Haley is already aware of the need (as I requested the money a couple of weeks ago), I want to send him a brief summary that directly responds to his request below that he could present to SLT.

This is also an opportunity to add any additional details, if there is any new info.

Thanks,

Ines

Begin forwarded message:

**From:** "Charmley, William" <[charmley.william@epa.gov](mailto:charmley.william@epa.gov)>  
**Date:** June 12, 2019 at 6:06:34 AM EDT  
**To:** "Storhok, Ines" <[storhok.ines@epa.gov](mailto:storhok.ines@epa.gov)>, "Sargeant, Kathryn" <[sargeant.kathryn@epa.gov](mailto:sargeant.kathryn@epa.gov)>  
**Subject:** FW: FY 2019 OTAQ Reserve Funds - Request for Proposals, Due to Haley by June 21

Ines –

Is our proposal for ASD the equipment for ethylene oxide testing? If yes, can send that in response to Mike Haley by COB on Friday of this week?

Do we have any request for additional funding for the CTI rule?

Thanks

Bill

---

**From:** Haley, Mike  
**Sent:** Monday, June 10, 2019 2:59 PM  
**To:** Charmley, William <[charmley.william@epa.gov](mailto:charmley.william@epa.gov)>; Bunker, Byron <[bunker.byron@epa.gov](mailto:bunker.byron@epa.gov)>; Haugen, David <[haugen.david@epa.gov](mailto:haugen.david@epa.gov)>; Simon, Karl <[Simon.Karl@epa.gov](mailto:Simon.Karl@epa.gov)>  
**Cc:** Cook, Leila <[cook.leila@epa.gov](mailto:cook.leila@epa.gov)>; Hengst, Benjamin <[Hengst.Benjamin@epa.gov](mailto:Hengst.Benjamin@epa.gov)>; Watkins, Erica <[Watkins.Erica@epa.gov](mailto:Watkins.Erica@epa.gov)>  
**Subject:** FY 2019 OTAQ Reserve Funds - Request for Proposals

All –

As you may recall, when we finalized our Division allocations for the FY 2019 Operating Plan, **Ex. 4 CBI** was set aside in an OTAQ “Reserve” account. The purpose of this note is to now provide you an opportunity to submit proposals for use of this reserve funding. Consistent with the purpose of this reserve funding, your proposals should focus on addressing any unanticipated program needs or new priorities that have emerged since our initial Operating Plan allocations. The reserve funding should be considered a “one-time” adjustment to your Operating Plan totals and should not be considered as a permanent adjustment to your base programs. Proposals should also be for activities or actions that can be funded relatively quickly.

Please submit your funding proposals to me (with a cc: to the DD group) by COB, Friday, June 21. I’ll will compile any submissions received and we will discuss the proposals at our scheduled DD Working Group meeting on Tuesday, June 25. Your proposals should include a brief description of the activity for which you are requesting funding, the total amount of your request, and a brief description of the outputs or outcome



expected to be achieved with your investment proposal. Let me know if you have any questions or need any additional information.

Mike H.

## Message

**From:** Fernandez, Antonio [fernandez.antonio@epa.gov]  
**Sent:** 11/19/2019 2:41:32 PM  
**To:** Walters, Charles [walters.charles@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]  
**Subject:** RE: Review of [REDACTED] Phase 5 EtO data

Angela,

Couple of follow-up items discussed at the 9:00AM meeting if you can forward to Tom:

- 1) Chuck wants to verify his belief that the Enthalpy data has a "cut and paste" mistake is only in the report and doesn't impact the actual calculations later (see below)
- 2) The [REDACTED] Round 4 (repeat E10) – Chris still looking for some of the emission data (HC,CO, NOx, distance, etc.) from the bags so he recalculate some emission rates, etc.

Thanks  
 Tony

---

**From:** Walters, Charles <walters.charles@epa.gov>  
**Sent:** Tuesday, November 19, 2019 8:05 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>  
**Subject:** Review of [REDACTED] Phase 5 EtO data

All,

I reviewed the data for the [REDACTED] Phase 5 EtO testing; here are my findings.

Reviewing the canister pressurization data on page 77, together with the controller data on page 78 of the Enthalpy report....

The controller flowrates selected for the 1060 s sample phase would suggest that 15 L canisters were used. However, the pressurization data and reported sample volumes indicate 6 L canisters. I suspect that 15 L canisters were actually used and this is a copy/paste issue in their pressurization spreadsheet. Furthermore, the spiking worksheets indicate 15 L canisters. If I back calculate all data using 15 L canister volume; the resulting calculated sample volume using the ideal gas law matches well with the expected sample volume based on flowrate and sample time.

My concern would be: Does this error continue downstream in the Enthalpy process to calculate a resulting concentration? I'm 95% convinced that the resulting canister Dilution Factor wouldn't change; however I don't know enough about the Enthalpy analysis and process to be sure that the resulting calculated concentration in the canister isn't affected.

I suggest we ask ORD/Enthalpy about this.

Thanks,  
 Chuck

## Message




**From:** Cullen, Angela [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FF1B7C0675434915BADE463AD4619509-CULLEN, ANGELA]  
**Sent:** 5/20/2019 5:09:28 PM  
**To:** Fernandez, Antonio [fernandez.antonio@epa.gov]  
**Subject:** FW: Dyno Testing in RTP

---


**From:** Cullen, Angela  
**Sent:** Friday, May 17, 2019 3:04 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Kathryn Sargeant (sargeant.kathryn@epa.gov) <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Richard and Tom,

Thank you for our discussions this week and your work on this project. This email is to circle back with what we discussed yesterday. Our near-term priorities are:

1.  GDI, normal test conditions - completed
2.  diesel, normal test conditions, with cold-start UDDS and warm UDDS cycles
3. TBD LD gasoline vehicle (PFI, naturally-aspirated, Tier 2 or Tier 3 certification level, significant sales volume), E10 fuel, FTP cycle, normal test conditions
4.  GDI, normal test conditions, Tier 2 certification fuel or market E0 fuel, FTP cycle

The other testing suggestions you sent are still important, but we want to first scope out which mobile source sectors emit EtO. We will be having discussions with our lab early next week to explore what we can do to test nonroad engines.

When you get a chance, would you please send a picture of the  emission control label?

Thank you,  
 Angela

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, May 15, 2019 4:38 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Hi Richard,

I just made it back to my phone. I can call you if that would be helpful.

This is an excellent list of some of the top priorities as we see them too. Given the urgency around getting some initial/screening diesel data it might make sense to start there and then meet next week to discuss further testing with Angela and our light-duty center director, Mike Olechiw.

For the testing next week on the diesel can you run both a cold and warm cycle? I am not a testing expert so I've cc'd Angela as this is her area of expertise. If at all possible, this testing is the current highest priority.

We will start the PR for [REDACTED] so that we can get funds supporting this work ASAP. I am confident we can send additional funds in June or July. Since we'll figure that out as we go, it sounds from your note like that kind of incremental funding situation could work, but we can discuss this further.

After we get a chance to orient Bill Charmley, our division director, to the results tomorrow, we will be setting up recurring meetings with him and we will invite you to those recurring meetings so that he can also hear from you directly and we can be discussing next steps in real time together.

I honestly cannot thank you enough not only for making this work your top priority, but the fact that you are generating the highest quality data possible in this emerging issue that has many complexities, is extraordinarily commendable.

Thank you!  
Marion

---

**From:** Shores, Richard  
**Sent:** Wednesday, May 15, 2019 4:01 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Long, Thomas <Long.Thomas@epa.gov>  
**Subject:** Dyno Testing in RTP

Marion,

After some discussion with Tom, we have come up with a preliminary strategy for the testing that could be possible. Keep in mind that vehicle testing typically costs us [REDACTED] Ex. 4 CBI including the rental and no EtO testing. This last round of EtO testing costs us [REDACTED]. We are considering the following tests/vehicles.

1. [REDACTED] GDI, normal test conditions completed
2. [REDACTED] diesel, maybe start next week without integrated modal HC data
3. Class 8 diesel, should have integrated modal HC data being recorded
4. PFI, gas, considering the idea of two tests, normal and cold test conditions
5. [REDACTED] GDI, cold test conditions
6. TBD vehicle, possible some pre/post catalyst sampling with canisters only?

Notice we are suggesting cold condition testing, what do you think? This data set in completion should go a long way to defining if the mobile source emissions are a significant component of the inventory. Our testing programs are typically buffered with time, allowing us the opportunity to leverage other project resources but more importantly the time we have available for those primarily responsible for the dyno operation. Given our need to collect data at an accelerated schedule translates into additional contractor support and additional costs. Given all the variables here and understanding that every test we conduct may cause us to change direction, my suggestion is to start the [REDACTED] testing as soon as we can, with or without a continuous HC monitor. Testing the vehicles listed above is assumed to cost more than [REDACTED] Ex. 1 October From (2019) but if you have that available, maybe we (ORD) can cover the additional costs. As this sampling occurs, we can keep in touch on the budget, specifically what the testing actually costs. Ultimately, we would like to complete the testing above with the funds available.

Richard Shores  
U.S. Environmental Protection Agency (E343-02)  
Office of Research and Development  
National Risk Management Research Laboratory  
Air and Energy Management Division  
Distributed Source & Buildings Branch  
Research Triangle Park, NC27711, USA  
Phone: (919) 541-4983

email: [shores.richard@epa.gov](mailto:shores.richard@epa.gov)

## Message

**From:** Cullen, Angela [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FF1B7C0675434915BADE463AD4619509-CULLEN, ANGELA]  
**Sent:** 5/24/2019 12:46:57 PM  
**To:** Charmley, William [charmley.william@epa.gov]  
**Subject:** For our 10:05 General Today

I will call you at Ex. 6 Personal Privacy (PP) at 10:05. The OneNote is updated, but here it is too:

## Ex. 6 Personal Privacy (PP)

- Continuing quarterly coordination meetings with CD as follow-up to LD OIG recommendation
- Lab testing
  - EtO testing: Throughout June ORD will be sampling the emissions from HD diesel truck, LD vehicle, and repeat of LD truck with E0. Working towards having TATD and possibly ASD staff to witness the sampling during the week of June 3 to obtain experience with collecting emissions in summa canisters.
  - LD Chassis plans: Air conditioning impact on emissions for MOVES (NOx correlation); 50F/75F PM testing with LEVIII fuel for CARB; Tula follow-up testing - ON HOLD; Stani's GPF evaluation
  - Dyno 5: Had been down for AVL upgrade - should be able to resume testing in 1-2 weeks
  - HD Chassis: Freightliner at SWRI. We conducted baseline testing of NCAT's Navistar truck. Currently at dealer for issues. Potential UM hybrid bus and Penn State electric bus - ON HOLD.
  - HD Engine: planning development work to evaluate cylinder deactivation. Spending time with CD and TATD to bring up to speed with respect to new fuel mapping procedures for GHG Phase 2.
  - LD Engine: continuing
  - PEMS:
    - Completed Axiom vs. Sensors equipment partially to evaluate the accuracy of data obtained by NC State that we are using for LD emission rate updates in MOVES
  - Robot Driver: Procurement in process. Technical Evaluation Panel of proposals begins next week.
  - Coordination with ECCC to test 2019MY Freightliner M2 (box truck) for CTI baseline. They are approximately 50% done with the test plan.
  - Brake wear testing at LINK, adding PM filter measurements
- Nonroad work
  - Coordinating with TCD on TRU emissions testing and speciation of 25kW diesel engines with and without DPF. Testing at Texas Transportation Institute underway.
  - Discussions ongoing with CRC/EMA/CARB regarding coordination for Ag equipment activity study
  - CE-CERT - PEMS testing 3 pieces of construction equipment, starting soon will be PAMS testing of approximately 50 pieces of equipment for 3-4 weeks each
  - Obtaining databases on nonroad registration information from states (engine hours, idle time, etc.) and Equipment Watch
  - Potentially obtaining marine emissions databases from UCR
  - Discussions with MTU about snowmobile and other rec vehicle activity data gathering
  - CARB activity - Agricultural equipment use survey, Low NOx for Nonroad Stage 1 with SWRI, evaluating feasibility of installing aftertreatment on small nonroad equipment (TRU, riding mower, skid steer, mini excavator)
  - Fuel effects discussion underway for nonroad and LD evap
- Refueling emissions to identify prevalence of "bad canisters" and ORVR issues will be held mid-July. Carl, Connie, and Tony plan to be present during a few days of testing.

- Public Access Plan update:
- Completing systems and instructions to make the data supporting publications publicly accessible.
  
- OTAQ Purchase Card Team Co-Chair with Erica
- ASD to reduce card holders by 2 (James Sanchez and Chuck Schenk). Patty Klavon is new Approving Official
- National Purchase Card team coming to NVFEL in mid-June for visit/training
  
- Procurement update
- Solicitation for FEV contract replacement completed and awarded to FEV
- 2-day meeting with HQAD and CAD this week

## Message




**From:** Laroo, Chris [laroo.chris@epa.gov]  
**Sent:** 5/20/2019 5:09:18 PM  
**To:** Fernandez, Antonio [fernandez.antonio@epa.gov]  
**Subject:** FW: Dyno Testing in RTP

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**From:** Cullen, Angela  
**Sent:** Friday, May 17, 2019 3:04 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>  
**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Richard and Tom,

Thank you for our discussions this week and your work on this project. This email is to circle back with what we discussed yesterday. Our near-term priorities are:

1.  GDI, normal test conditions - completed
2.  diesel, normal test conditions, with cold-start UDDS and warm UDDS cycles
3. TBD LD gasoline vehicle (PFI, naturally-aspirated, Tier 2 or Tier 3 certification level, significant sales volume), E10 fuel, FTP cycle, normal test conditions
4.  GDI, normal test conditions, Tier 2 certification fuel or market E0 fuel, FTP cycle

The other testing suggestions you sent are still important, but we want to first scope out which mobile source sectors emit EtO. We will be having discussions with our lab early next week to explore what we can do to test nonroad engines.

When you get a chance, would you please send a picture of the  emission control label?

Thank you,  
 Angela

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, May 15, 2019 4:38 PM  
**To:** Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Hi Richard,

I just made it back to my phone. I can call you if that would be helpful.

This is an excellent list of some of the top priorities as we see them too. Given the urgency around getting some initial/screening diesel data it might make sense to start there and then meet next week to discuss further testing with Angela and our light-duty center director, Mike Olechiw.

For the testing next week on the diesel can you run both a cold and warm cycle? I am not a testing expert so I've cc'd Angela as this is her area of expertise. If at all possible, this testing is the current highest priority.



**Ex. 4 CBI**

so that we can get funds supporting this work ASAP. I am confident we can send additional funds in June or July. Since we'll figure that out as we go, it sounds from your note like that kind of incremental funding situation could work, but we can discuss this further.

After we get a chance to orient Bill Charmley, our division director, to the results tomorrow, we will be setting up recurring meetings with him and we will invite you to those recurring meetings so that he can also hear from you directly and we can be discussing next steps in real time together.

I honestly cannot thank you enough not only for making this work your top priority, but the fact that you are generating the highest quality data possible in this emerging issue that has many complexities, is extraordinarily commendable.

Thank you!  
Marion

**From:** Shores, Richard

**Sent:** Wednesday, May 15, 2019 4:01 PM

**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>

**Cc:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>

**Subject:** Dyno Testing in RTP

Marion,

After some discussion with Tom, we have come up with a preliminary strategy for the testing that could be possible. Keep in mind that vehicle testing typically costs us **Ex. 4 CBI** including the rental and no EtO testing. This last round of EtO testing costs us **Ex. 4 CBI**. We are considering the following tests/vehicles.

1. **Ex. 4 CBI**, GDI, normal test conditions completed
2. **Ex. 4 CBI**, diesel, maybe start next week without integrated modal HC data
3. Class 8 diesel, should have integrated modal HC data being recorded
4. PFL gas, considering the idea of two tests, normal and cold test conditions
5. **Ex. 4 CBI**, GDI, cold test conditions
6. TBD vehicle, possible some pre/post catalyst sampling with canisters only?

## **Ex. 5 Deliberative Process (DP)**

buffered with time, allowing us the opportunity to leverage other project resources but more importantly the time we have available for those primarily responsible for the dyno operation. Given our need to collect data at an accelerated schedule translates into additional contractor support and additional costs. Given all the variables here and understanding that every test we conduct may cause us to change direction, my suggestion is to start the **Ex. 4 CBI** testing as soon as we can, with or without a continuous HC monitor. Testing the vehicles listed above is assumed to cost more than **Ex. 4 CBI** but if you have that available, maybe we (ORD) can cover the additional costs. As this sampling occurs, we can keep in touch on the budget, specifically what the testing actually costs. Ultimately, we would like to complete the testing above with the funds available.

Richard Shores  
U.S. Environmental Protection Agency (E343-02)  
Office of Research and Development  
National Risk Management Research Laboratory  
Air and Energy Management Division  
Distributed Source & Buildings Branch  
Research Triangle Park, NC27711, USA  
Phone: (919) 541-4983  
email: [shores.richard@epa.gov](mailto:shores.richard@epa.gov)

## Message

**From:** Fernandez, Antonio [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D55116A355544048B06C0AA85F17AA7C-FERNANDEZ, ANTONIO]  
**Sent:** 5/31/2019 2:06:31 PM  
**To:** McDonald, Joseph [mcdonald.joseph@epa.gov]  
**Subject:** RE: Multi-phase EtO Study

Joe,  
 That's interesting. I thought that everything light duty (under 8500) and HD engine certified has the DPF ahead of the SCR. Chassis certified 2b/3 were the exception. I am not familiar with **Ex. 4 CBI** emission control designs in 2011 but maybe we could ask the Compliance Division to pull up the certification diagram for that MY?

### **Ex. 5 Deliberative Process (DP)**

Tony

---

**From:** Long, Thomas  
**Sent:** Friday, May 31, 2019 7:36 AM  
**To:** McDonald, Joseph <McDonald.Joseph@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Sanchez, James <sanchez.james@epa.gov>  
**Subject:** RE: Multi-phase EtO Study

Joe,

The SCR is upstream of the DPF.

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

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**From:** McDonald, Joseph  
**Sent:** Thursday, May 30, 2019 7:47 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Sanchez, James <sanchez.james@epa.gov>  
**Subject:** Re: Multi-phase EtO Study

Tom,

Can you confirm the order of the devices in the catalyst system? Is the DPF positioned upstream or downstream of the SCR substrate? It does make a difference with respect to some air toxic emissions. You can determine the SCR position

from the location of the urea (aka DEF) injector. SCR is always positioned immediately after the urea injector. The DPF can be visually identified from the plugs on alternating channels on either the inlet or outlet if you can get visual access to either side.

Thanks,

Joe

Regards,

Joe

Joseph McDonald  
Senior Engineer

U.S. EPA  
ORD/NRMRL & OAR/OTAC  
Mail Stop: 236  
26 W. Martin Luther King Dr.  
Cincinnati, Ohio 45268 USA

Telephone (USA): 513-569-7421  
Cellular Telephone: 513-316-2380  
E-mail: mcdonald.joseph@epa.gov

On May 30, 2019, at 6:24 PM, Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)> wrote:

Hi Tom,

I apologize for my slow response on this!! I thought I had replied and realized today that I hadn't.

This all sounds good to me, but I am not the emission testing guru so I'm sure others would pipe up if they have suggestions or questions.

When you get to the Phase 3 testing on the second LDGV vehicle running on E10, let's touch base so we agree on the vehicle to test. We had a conversation here yesterday and there are some options we have for vehicles we could send to you if you don't have some ready options there.

Will Phase 5 be the HDDT that you'll be acquiring for the CTI testing that James Sanchez and you have been discussing?

I'll be in touch separately on funds.  
Marion

---

**From:** Long, Thomas  
**Sent:** Tuesday, May 21, 2019 12:31 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>  
**Cc:** Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>; Geidosch, Justine <[Geidosch.Justine@epa.gov](mailto:Geidosch.Justine@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; McDonald, Joseph <[McDonald.Joseph@epa.gov](mailto:McDonald.Joseph@epa.gov)>; Baldauf, Richard <[Baldauf.Richard@epa.gov](mailto:Baldauf.Richard@epa.gov)>  
**Subject:** Multi-phase EtO Study

Marion and Angela,

We are having a communication issue with one of our instruments in the lab which is delaying our ability to complete pre-test calibrations. Also, we have a key technician with a vacation scheduled for next week. We would like to postpone the testing to make sure we have experienced personnel at every position and have adequately confirmed our calibration requirements.

I am still waiting to hear about the THC analyzer. They have begun the evaluation but have not completed a diagnosis at which point we can evaluate the value of an expedited repair. I am also waiting to get a quote from Enthalpy which is due today.

I need to submit a Performance Work Statement mod and QAPP addendum for this work. Would you mind reviewing the tentative plan and schedule below and either confirm that this meets your requirements or recommend modifications? (There is probably more detail than you want about controllers, but I want to keep it all straight in my own mind as well.)

### Phase 1 (Complete)

Source: Light-duty SI vehicle

Dilution: Can 0098 was 30.16:1; Can 0080 was 18.99:1; Can 0001 was 21.18:1. The dilution ratio varied during Cans 0728, 0039, and 0066 in the range of 26:1.

### Phase 2 (June 3)

Vehicle: 2011 Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked → 15 total

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

### Phase 3 (June 17)

Vehicle: A common naturally aspirated PFI light-duty vehicle

Fuel: Tier 3 E10 cert fuel

Lab: Light-duty dynamometer facility.

Sampling days: 3

Driving schedules: FTP75 and Supplemental FTP.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

Cans required:

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

**Controllers required:**

1 controller per day for cold start transient, source, 505 seconds.  
 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds  
 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds  
 1 controller per day for source, US06, 596 seconds.  
 2 controllers for background ambient per day, 1372 seconds  
 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

**Phase 4 (June 24 or July 8)**

Vehicle: Ex. 5 Deliberative Process (DP) turbocharged GDI 2.7L (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

**Cans required:**

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

**Controllers required:**

1 controller per day for cold start transient, source, 505 seconds.  
 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds  
 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds  
 1 controller per day for source, US06, 596 seconds.  
 2 controllers for background ambient per day, 1372 seconds  
 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

---

Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944



## Message

**From:** Geidosch, Justine [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=892C102646DC4BF8BE7D30CF4E561F01-GEIDOSCH, JUSTINE]  
**Sent:** 5/16/2019 1:42:02 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]  
**Subject:** RE: NRMRL EtO Method Status

Probably right. I think the issue is Ingrid doesn't think she'll be able to do a really good job at detection limits without the instrument upgrades, and without the DL we wouldn't have her doing the analysis in house anyway. It's possible she's able to get it better than she expects with the tweaking that she is currently doing, but unlikely.

Sounds like she thinks the contractor is doing a good job at analyzing the samples, but that the method isn't anything she couldn't do with the right equipment. She did sound pretty excited at the idea of testing and would love to be doing the analysis, just a matter of funding to get the right equipment.

---

**From:** Hoyer, Marion  
**Sent:** Wednesday, May 15, 2019 8:06 PM  
**To:** Geidosch, Justine <Geidosch.Justine@epa.gov>  
**Subject:** RE: NRMRL EtO Method Status

Thank you Justine! This is super helpful. I have stared an EtO budget spreadsheet and will add this in for discussion as we move forward. Am I right in thinking she would need the ☐ for summa cans after she can upgrade the instrument?

---

**From:** Geidosch, Justine  
**Sent:** Wednesday, May 15, 2019 5:21 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>  
**Subject:** NRMRL EtO Method Status

I spoke with Ingrid George this afternoon about her work on developing the method for measuring EtO. She is still working on getting the method up and running; sounds like she has a bit more tweaking to get confidence in her method, but that she thinks they can get it working soon. She's been working with ambient samples to make sure she has the method down before she moves to working on exhaust samples.

They are planning on pulling ambient samples from two different sites this Summer and having her measure the EtO. Both are around RTP – one is a near roadway site and the other is more remote. I believe Ingrid said she was working with OAQPS on this, but I could be wrong about that.

She also mentioned that she needs to do some significant upgrades to her instrumentation to be able to get detection limits that are comparable to the contract labs. Ingrid's current equipment isn't optimized for EtO, and while the GCs she has are capable of doing the analysis, she needs upgrades, likely a new preconcentrator setup. She estimates it will cost about ☐ to get the instrument to where it needs to be for the best analysis. Also on the funding front, she needs a set of summa canisters that are better for EtO than the ones she uses for TO-15. I guess she has one or two cans, but would need a full set to do a good amount of dyno sampling. She thinks it would cost about ☐ for a set of 20. I told her I would check if OTAQ would be able to contribute any funding towards moving the analysis in house, so let me know if you have any thoughts.

Overall, got the impression that she is pretty confident in her ability to make the measurements, but doesn't think she'll be able to get to as low detection limits as we've seen from the contract labs without investing some money in the setup. Let me know if there are any additional questions you want me to look into.

Thanks,  
Justine

Justine Geidosch  
Physical Scientist, Assessment and Standards Division  
Office of Transportation and Air Quality  
US Environmental Protection Agency

Ph: (734) 214-4923  
[geidosch.justine@epa.gov](mailto:geidosch.justine@epa.gov)



## Message

**From:** Haugen, David [haugen.david@epa.gov]  
**Sent:** 6/10/2019 4:37:36 PM  
**To:** Bryson, James [bryson.james@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Peralta, Maria [Peralta.Maria@epa.gov]; Walters, Charles [walters.charles@epa.gov]  
**Subject:** FW: Update on mobile source EtO testing and related issues  
**Attachments:** Ethylene Oxide and Mobile Sources for the SLT May 2019 v2.docx

All,

The email string below provides both the latest update from ORD (bottom of this note) and thoughts ASD is having w.r.t a test plan.

I've also attached a briefing that was shared with the SLT two weeks ago, for Jim, Kat and Chucks' benefit (TATD managers have already seen this document, which should not be broadly shared).

Thanks, David

**From:** Cullen, Angela  
**Sent:** Monday, June 10, 2019 12:04 PM  
**To:** Charmley, William <charmley.william@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>; Haugen, David <haugen.david@epa.gov>; Storhok, Ines <storhok.ines@epa.gov>  
**Cc:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Bryson, James <bryson.james@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>  
**Subject:** RE: Update on mobile source EtO testing and related issues

Bill,

Below are responses to two of your questions. If you are not comfortable with the approach, then we can make adjustments.

2) Regarding the Phase 3 (June 17) vehicle, what type of guidance is OTAQ giving to ORD regarding the selection of the pfi vehicle? Recent model year? Engine family with super high sales? Well maintained? Low, medium, high mileage? We have requested a recent model year (Tier 2 or Tier 3), high sales volume, well maintained, and PFI. We have not specified the mileage. ORD is working with Joe McDonald on the selection and they will let us know prior to testing the vehicle. We will know more later this week.

3) Regarding the fuel for the Phase 3 testing (June 17 week). I know that we must have discussed the potential for an E0 testing for Phase 3, in addition to the Tier 3 E10 fuel. What is the thinking on for this vehicle, testing only on a Tier 3 certification gasoline, and not also adding to the testing a Tier 2, E0 test fuel? We have been focusing on E10 fuel for the first round of LD gasoline testing because our first goal is to determine if/what mobile sources are contributing to the ambient EtO emissions. Because this is an in-use issue, we want to test with fuel that is representative of in-use fuel (E10). We prioritized the PFI testing with E10 next to continue to help answer what sources are contributing to the ambient EtO emissions. For now, we are testing a GDI and a PFI vehicle to cover the two major LD engine technologies. In addition, we only want to change one thing at a time. We will be comparing the results of Phase 1 with Phase 3 to understand any potential differences due to engine technologies. The evaluation with the E0 fuel is secondary as we try to try to understand potential mechanisms for the formation of EtO. If we find a difference in the results between Phases 1 and 4, then we will add E0 fuel to our light-duty testing matrix going forward.

Others may have additional information to add, so please feel free. And we'd be happy to discuss more with you.

Angela

---

**From:** Charmley, William

**Sent:** Monday, June 10, 2019 10:39 AM

**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Haugen, David <haugen.david@epa.gov>; Storhok, Ines <storhok.ines@epa.gov>

**Cc:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Bryson, James <bryson.james@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>

**Subject:** RE: Update on mobile source EtO testing and related issues

Dear Marion (and everyone),

Thank you for this update. Three questions.

- 1) Ines – please let David and I know if you need us to do any outreach to Mike Haley or Lee regarding the funding request for the analytical equipment
- 2) Regarding the Phase 3 (June 17) vehicle, what type of guidance is OTAQ giving to ORD regarding the selection of the pfi vehicle? Recent model year? Engine family with super high sales? Well maintained? Low, medium, high mileage?
- 3) Regarding the fuel for the Phase 3 testing (June 17 week). I know that we must have discussed the potential for an E0 testing for Phase 3, in addition to the Tier 3 E10 fuel. What is the thinking on for this vehicle, testing only on a Tier 3 certification gasoline, and not also adding to the testing a Tier 2, E0 test fuel?

Thanks  
Bill

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**From:** Hoyer, Marion

**Sent:** Monday, June 10, 2019 9:28 AM

**To:** Charmley, William <charmley.william@epa.gov>; Haugen, David <haugen.david@epa.gov>

**Cc:** Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Bryson, James <bryson.james@epa.gov>; Kolowich, Bruce <kolowich.bruce@epa.gov>

**Subject:** Update on mobile source EtO testing and related issues

Bill and David,

We are on your calendars for June 27 to give you an update on ethylene oxide and discuss ongoing work and plans. Since we had to cancel this week's in-person update, we've briefly summarized highlights below.

■ NRMRL is finishing initial emissions testing for EtO from a F750 diesel truck this week ("Phase 2" test noted in the list below). We should have results in 3-4 weeks. NRMRL is moving down this list of vehicles to test in sequential order. We are talking about adding a HD gasoline truck after the Class 8 diesel (into July).

■ Three people from OTAQ (Chris Laroo, Kat Loftis, and Jim Bryson ) visited the NRMRL facility last Wednesday to learn about their sampling methods so that we can set up sampling into summa canisters here at NVFEL. We are meeting weekly to talk about next steps with regard to sampling here and priorities for the testing we'll be conducting.

■ Ines is working with Mike Haley to see if the IO can fund a <sup>Ex. 4 CBI</sup> purchase of analytical equipment so that ORD can bring an analytical method on-line this summer/fall that is equivalent to the method used by the contractor we are currently using. This will provide the analysis capability we will need as we start to generate samples at NVFEL and continue to test in NRMRL. We are also talking with Bruce and Kat about the analytical methods they are evaluating.

Let us know if you have questions.

#### Phase 1 (Complete)

Source: Light-duty SI vehicle <sup>Ex. 5 Deliberative Process (DP)</sup>

#### Phase 2 (June 3)

Vehicle: <sup>Ex. 5 Deliberative Process (DP)</sup> Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

#### Phase 3 (June 17)

Vehicle: A common naturally aspirated PFI light-duty vehicle

Fuel: Tier 3 E10 cert fuel

#### Phase 4 (June 24 or July 8)

Vehicle: <sup>Ex. 5 Deliberative Process (DP)</sup> Turbocharged GDI 2.7L (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

#### Phase 5 (tbd)

Vehicle: Class 8 HDDT

## Message

**From:** Loftis, Kathy [loftis.kathy@epa.gov]  
**Sent:** 7/18/2019 12:14:19 PM  
**To:** Kolowich, Bruce [kolowich.bruce@epa.gov]  
**Subject:** FW: Follow-up on NRMRL Calibration Standard and Sample Can Stability

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**From:** Laroo, Chris  
**Sent:** Wednesday, July 17, 2019 2:30 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Choi, David <Choi.David@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>  
**Subject:** RE: Follow-up on NRMRL Calibration Standard and Sample Can Stability

## Ex. 5 Deliberative Process (DP)

The concern about stability for humid samples came from the Enthalpy work presented by Berkowitz. The concern is stability in humidity (humidity concentrations were not given by Berkowitz, but EtO concentrations tested were 40 ppt, 200 ppt, and 800 ppt) out past 25 days. There are large deviations (+25%) in the Berkowitz work for the 30 day measurements (positive bias over time for humid environment, negative for dry). I am not exactly sure what the water content of our dilute samples are, but I think that a ball park might be 90% of the dilute CO<sub>2</sub> concentration, so from the work, CO<sub>2</sub> in Ph 1 is 4300 ppm equating to roughly 3900 ppm water. Stability could be a concern for dilute exhaust gas samples, but I need to track down what the water concentrations is from the Berkowitz work.

The calibration standard stability concern stemmed from work done by Doris Chen. She had a lab (either ERG or NIST) analyze two cylinders of EtO at 0, 30, and 60 days and showed a degradation of up to 20%. Tiffany is performing follow-up work with 12 to 16 cylinders of varying EtO concentrations to build on Doris' work.

Tiffany and others are confident in the analytical procedure developed by Enthalpy down to about 35 ppt for ambient EtO measurements as they feel that Enthalpy has addressed interference (co-elution) concerns (MeOH, trans-2-butene, acetaldehyde). They are still concerned, however, with the method as it applies to combustion sources. They feel that more work is needed to assess degradation in the cannister (although I would argue that the spiked cannisters that were then used to sample exhaust support stability) and determine if there are any other potential interferences from the complex exhaust hydrocarbon matrix.

Ultimately she would like to see multiple GC/MS instruments running the method and returning the same results for a given sample.

To get around sample stability concerns, her ultimate goal would be an on-line method. She is big on a cavity ring down analyzer that was modified from a methane analyzer by the manufacturer. This instrument has a DL of about 1 ppb for a 60s average of 1 Hz samples. She feels that the 1 ppb DL would be more than adequate for raw exhaust measurement (I did not bring up sampling proportionality concerns as that can be addressed after proving out the method). She plans to evaluate the analyzer in the near future and will pay particular attention to potential sources of interference.

That about sums it up. I have a better understanding of her concerns. I think that we can be confident that the hits we get on EtO from the NRMRL testing are real, but can only be considered qualitative at this time.

Regards,

Chris Laroo  
Environmental Protection Specialist  
US Environmental Protection Agency  
Office of Transportation and Air Quality  
Assessment and Standards Division  
2000 Traverwood Dr.  
Ann Arbor, MI 48105  
(734) 214-4937  
(734) 214-4055 (fax)  
Email: laroo.chris@epa.gov

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**From:** Hoyer, Marion  
**Sent:** Wednesday, July 10, 2019 1:47 PM  
**To:** Laroo, Chris <laroo.chris@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Choi, David <Choi.David@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>  
**Subject:** RE: Follow-up on NRMRL Calibration Standard and Sample Can Stability

Thanks Chris for looking at what she sent.

## Ex. 5 Deliberative Process (DP)

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**From:** Laroo, Chris  
**Sent:** Wednesday, July 10, 2019 11:24 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Cc:** Cullen, Angela <cullen.angela@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Choi, David <Choi.David@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>  
**Subject:** Follow-up on NRMRL Calibration Standard and Sample Can Stability

Marion,

I am just following up on what Tiffany sent us following our Monday meeting on EtO. I am perplexed by NRMRL's concerns over the stability of EtO calibration standards and sample stability in the sample can. My understanding was that Tiffany was citing the presentation and abstract provided by Enthalpy to call into question the stability of the calibration standards and the sample in the can over time. I reviewed the documents she provided and I did not find anything from what Enthalpy presented that raised red flags. To the contrary, the Enthalpy work supported calibration standard stability as well as sample stability. So I guess I'm a little confused. It might be beneficial to have a discussion with Tiffany to figure out what specifically her concerns are.

Regards,

Chris Laroo  
Environmental Protection Specialist

US Environmental Protection Agency  
Office of Transportation and Air Quality  
Assessment and Standards Division  
2000 Traverwood Dr.  
Ann Arbor, MI 48105  
(734) 214-4937  
(734) 214-4055 (fax)  
Email: [laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)

Appointment

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**From:** Shappley, Ned [Shappley.Ned@epa.gov]  
**Sent:** 4/1/2019 12:10:57 PM  
**To:** Loftis, Kathy [loftis.kathy@epa.gov]; Lowe, Theresa [Lowe.Theresa@epa.gov]  
**Subject:** FW: EO/PO Method  
**Attachments:** EO&PO Method.pdf  
**Location:** Enthalpy  
  
**Start:** 4/1/2019 1:30:00 PM  
**End:** 4/1/2019 3:00:00 PM  
**Show Time As:** Tentative

Kat,

In keeping you in the loop with EtO methodology, I wanted to forward you this invite to you. This meeting is with the lab that had done the canister work on the generator in RTP. There are some issues with sampling and measuring this way, so the lab wanted to talk to us regarding an alternative pathway.

This meeting will discuss the attached scenario as well as some other approaches. The attached method is another derivatization method like the brominated traps, but may be better suited for sampling streams with greater moisture content which would likely play havoc on the traps.

Thanks,  
Ned

-----Original Appointment-----

**From:** Shappley, Ned  
**Sent:** Tuesday, 26 March, 2019 10:18  
**To:** Shappley, Ned; Kariher, Peter; RTP-E101-Max40/RTP-Bldg-E; Dewees, Jason; Merrill, Raymond; Nash, Dave; Ryan,

## Ex. 6 Personal Privacy (PP)

**Cc:** David Berkowitz; Yelverton, Tiffany  
**Subject:** EO/PO Method  
**When:** Monday, 1 April, 2019 9:30 AM-11:00 AM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** Enthalpy

Adding a number and background document

Ex. 6 Personal Privacy (PP)

Discussion with Enthalpy @ in E-101 regarding Method 18(ish) aqueous approach for Eto at combustion sources.

## Message

**From:** Geidosch, Justine [Geidosch.Justine@epa.gov]  
**Sent:** 3/28/2019 2:13:57 PM  
**To:** Loftis, Kathy [loftis.kathy@epa.gov]  
**Subject:** RE: Ethylene oxide method

Hi Kat,

Thanks for the update, good to know its looking promising so far! I'll let you know when I hear about how it is going at ORD – they are looking to gear up pretty soon for some light-duty testing, but they'll only be collecting canisters and having them sent to an outside lab for analysis. You might want to get in touch with Ned Shappley in ORD – he isn't involved in this testing directly, but he works on method research and has been looking into test methods for EtO. I'll send you both an email, as it's possibly he's worked on a similar method to you and may have some advice.

## Ex. 6 Personal Privacy (PP)

Justine

---

**From:** Loftis, Kathy  
**Sent:** Wednesday, March 27, 2019 5:40 PM  
**To:** Geidosch, Justine <Geidosch.Justine@epa.gov>  
**Subject:** RE: Ethylene oxide method

Hey Justine,

Thanks for contacting me about this. We are definitely going in this direction. I have been working on it. I've been working on developing the chromatography method, and that is looking good. I am waiting on a few final pieces so I can assess the adsorbent tubes themselves. We've been working with Maria to coordinate the use of a test cell to assess the total sampling process, but we are waiting on gases.

What's the status with the ORD lab? Have you sent off samples yet?

It'd be great to be kept in the loop. Please do give me a heads-up of developments.

I'll be in touch with progress on my end.

Cheers,  
Kat

Side Note: Are you going to the Grotto this Friday? It'd be great to catch up outside of work.

---

**From:** Geidosch, Justine  
**Sent:** Wednesday, March 27, 2019 5:28 PM  
**To:** Loftis, Kathy <[loftis.kathy@epa.gov](mailto:loftis.kathy@epa.gov)>  
**Subject:** Ethylene oxide method

Hi Kat,



Just wanted to check in with you and see how the work was going into looking at an ethylene oxide analysis method. Are you guys still going in the direction of the brominated cartridge method? We've been looking into moving forward with some testing at the ORD lab, so was just wondering if you are still pursuing the method you had mentioned earlier.

Thanks,  
Justine

Justine Geidosch  
Physical Scientist, Assessment and Standards Division  
Office of Transportation and Air Quality  
US Environmental Protection Agency

Ph: (734) 214-4923  
[geidosch.justine@epa.gov](mailto:geidosch.justine@epa.gov)

## Message

**From:** Loftis, Kathy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=6ADB5ED644534810BB9F559C66CC3701-LOFTIS, KAT]  
**Sent:** 7/31/2019 12:38:14 AM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; George, Ingrid [George.Ingrid@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]; Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]; Shappley, Ned [Shappley.Ned@epa.gov]; Kariher, Peter [Kariher.Peter@epa.gov]; Chen, Xi [Chen.Xi@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Shores, Richard [Shores.Richard@epa.gov]; Weinstock, Lewis [Weinstock.Lewis@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]  
**CC:** Dewees, Jason [Dewees.Jason@epa.gov]  
**Subject:** RE: TO15 and Enthalpy methods applied to mobile sources  
**Attachments:** 190726\_Questions.docx

I'm attaching a list of questions that I have, to which you may already have answers. This may offer a starting point for tomorrow's conversation.

-----Original Appointment-----

**From:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Sent:** Wednesday, July 24, 2019 10:43 AM  
**To:** Hoyer, Marion; George, Ingrid; Loftis, Kathy; Kolowich, Bruce; Yelverton, Tiffany; Shappley, Ned; Kariher, Peter; Chen, Xi; Cullen, Angela; Cook, Rich; Laroo, Chris; Shores, Richard; Weinstock, Lewis; Walters, Charles; Long, Thomas  
**Cc:** Dewees, Jason  
**Subject:** TO15 and Enthalpy methods applied to mobile sources  
**When:** Wednesday, July 31, 2019 9:00 AM-10:00 AM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** AA-Room-Office-C35-ConfRoom/AA-OTAO-OFFICE

Let's use this callin number:

### Ex. 6 Personal Privacy (PP)

This meeting is in regard to the email I sent below:

**From:** Hoyer, Marion  
**Sent:** Wednesday, July 24, 2019 10:29 AM  
**Subject:** FW: F750 EtO Results

Hi All,

With the latest round of analyses on motor vehicle exhaust EtO from Enthalpy in hand, we are interested in getting in touch, first to talk about the TO15 analytical approach and results from Enthalpy's analysis in a more detailed way.

Kat is putting together a set of questions that might be something that those of you who are familiar with Enthalpy's work could help address. We are thinking there might be additional questions that we'll want to ask Enthalpy, but it makes sense to start internally first.

Kat will send the questions we have and possibly we can iterate by email, but I'll look for a time for us to talk too.

Thanks,

Marion

## Message

**From:** Loftis, Kathy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=6ADB5ED644534810BB9F559C66CC3701-LOFTIS, KAT]  
**Sent:** 7/9/2019 12:59:03 PM  
**To:** Yelverton, Tiffany [Yelverton.Tiffany@epa.gov]  
**Subject:** RE: Mobile source EtO testing

Tiffany,

Many thanks for this!

Kat

**Kathy M. Loftis, PhD**

Chemist  
Fuels Chemistry Center  
Testing and Advanced Technology Division  
National Vehicle and Fuel Emissions Laboratory  
US Environmental Protection Agency  
Ph: 734-214-4624  
Fax: 734-214-4440  
[loftis.kathy@epa.gov](mailto:loftis.kathy@epa.gov)

---

**From:** Yelverton, Tiffany  
**Sent:** Monday, July 8, 2019 11:59 AM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Walters, Charles <walters.charles@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Baldauf, Richard <Baldauf.Richard@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; George, Ingrid <George.Ingrid@epa.gov>; Hays, Michael <Hays.Michael@epa.gov>; Choi, David <Choi.David@epa.gov>; Kariher, Peter <Kariher.Peter@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Loftis, Kathy <loftis.kathy@epa.gov>  
**Cc:** Weinstock, Lewis <Weinstock.Lewis@epa.gov>  
**Subject:** RE: Mobile source EtO testing

Hello All,

Please find attached the extended abstract for the presentation given by David Berkowitz at the AWMA Measurements conference (April 2019) that I was referring to on the call. I'm working to try and locate my copy of the slides, but this abstract has much (if not all) of what he covered in the presentation.

Best,  
Tiffany

---

*Tiffany L. B. Yelverton, Ph.D.*  
Mechanical Engineer

Stationary Source Branch  
 Office of Research & Development  
 U. S. Environmental Protection Agency  
 109 T. W. Alexander Drive (E305-01)  
 Research Triangle Park, NC 27711

919.541.9456 (office)  
 919.541.0554 (fax)

-----Original Appointment-----

**From:** Hoyer, Marion

**Sent:** Sunday, June 23, 2019 2:57 PM

**To:** Hoyer, Marion; Cullen, Angela; Cook, Rich; Laroo, Chris; Nelson, Brian; Walters, Charles; Fernandez, Antonio; Shores, Richard; Long, Thomas; Baldauf, Richard; Yelverton, Tiffany; McDonald, Joseph; George, Ingrid; Hays, Michael; Choi, David; Kariher, Peter; Olechiw, Michael; Loftis, Kathy

**Cc:** Weinstock, Lewis

**Subject:** Mobile source EtO testing

**When:** Monday, July 08, 2019 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).

**Where:** AA-Room-Office-S109-ConfRoom/AA-OTAA-OFFICE

## Ex. 6 Personal Privacy (PP)

This meeting is to continue our discussion of the testing underway in NRMRL and the planning for testing here in NVFEL.

Our agenda for this meeting:

- Follow-up from 7/2 cross-office conversation on the nascent stage of EtO sample collection and analysis, particularly for source samples
  - What are the key uncertainties in the methods we are currently applying to understand mobile sources and EtO emissions?
  - Should we be considering all results purely qualitative until full methods development and cross-meth/cross-lab "shoot-out" (i.e., is there too much uncertainty in the measurements we are taking now to estimate an emission factor and have any trust in it)?
- Update from NRMRL on results from the Ex. 5 Deliberative Process (DP)
- Update from NRMRL on plans and sequencing for vehicles to be tested next in July and August
  - Week of July 8, PFI with E10
  - Later in July, Ex. 5 with E0
  - August HD Gasoline truck E10
- Update from NVFEL on testing plans
  - Preparing for sample collection
  - Engines to prioritize - Nonroad

Appointment

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**From:** Loftis, Kathy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=6ADB5ED644534810BB9F559C66CC3701-LOFTIS, KAT]  
**Sent:** 5/14/2019 10:01:53 PM  
**To:** Bryson, James [bryson.james@epa.gov]

**Start:** 5/16/2019 2:00:00 PM  
**End:** 5/16/2019 3:00:00 PM  
**Show Time As:** Tentative

**Required Attendees:** Bryson, James

Jim,

Hi. I hope this email finds you well. I mentioned a few weeks ago (**Ex. 6 Personal Privacy (PP)**) that I would be in touch about ethylene oxide testing in the cold cell. Background: there is a push to test vehicles for (putative) ethylene oxide emissions. This testing will require emission sampling with small adsorbent tubes, similar to the aldehyde sampling, with subsequent extraction and analysis in the chem lab. First, however, we must verify recovery efficiency of the sample tubes and sampling method. To do so, we will introduce a known amount of ethylene oxide into the dilution tunnel (cold cell) and recapture it in adsorbent tubes loaded on the sampling manifold.

I would like to meet with you to discuss details and timing. I am also hoping that you might be able to teach me a bit about the intricacies of sampling in the cells. I have a general overview, based on what I have gathered through conversation and reading, but I assume you can offer a wealth of information.

I am proposing a meeting time here, but if this is not feasible, just let me know when is best. I also did not suggest a location, but assumed that meeting in the cold cell would be easiest. Does this work?

Thanks for your time,  
Kat

**Kathy M. Loftis**  
Chemist, Fuels Chemistry Center  
Testing and Advanced Technology Division  
National Vehicle and Fuel Emissions Laboratory  
US Environmental Protection Agency  
Ph: 734-214-4624  
Fax: 734-214-4440  
[loftis.kathy@epa.gov](mailto:loftis.kathy@epa.gov)

## Appointment

**From:** Cullen, Angela [cullen.angela@epa.gov]  
**Sent:** 11/13/2019 7:21:36 PM  
**To:** Cullen, Angela [cullen.angela@epa.gov]; Baldauf, Richard [Baldauf.Richard@epa.gov]; Long, Thomas [Long.Thomas@epa.gov]; Loftis, Kathy [loftis.kathy@epa.gov]; Walters, Charles [walters.charles@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Hoyer, Marion [hoyer.marion@epa.gov]; Faircloth, James [Faircloth.James@epa.gov]; Kariher, Peter [Kariher.Peter@epa.gov]; Nessley, Libby [Nessley.Libby@epa.gov]; Kolowich, Bruce [kolowich.bruce@epa.gov]  
**Subject:** EtO Discussion  
**Location:** AA-Room-Office-C147-ConfRoom/AA-OTAQ-OFFICE  
**Start:** 11/26/2019 3:00:00 PM  
**End:** 11/26/2019 3:30:00 PM  
**Show Time As:** Busy

**Required Attendees:** Richard Baldauf; Long, Thomas; Loftis, Kathy; Walters, Charles; Cook, Rich; Fernandez, Antonio; Laroo, Chris; Hoyer, Marion; Faircloth, James; Kariher, Peter; Nessley, Libby; Kolowich, Bruce

### Ex. 6 Personal Privacy (PP)

Please pass the invitation on to others, as appropriate

#### Updated Agenda:

- Concern with results from Ex. 4 CBI HD Gasoline Truck (Phase 5) from Chuck Walters:

*Reviewing the canister pressurization data on page 77, together with the controller data on page 78 of the Enthalpy report....*

*The controller flowrates selected for the 1060 s sample phase would suggest that 15 L canisters were used. However, the pressurization data and reported sample volumes indicate 6 L canisters. I suspect that 15 L canisters were actually used and this is a copy/paste issue in their pressurization spreadsheet. Furthermore, the spiking worksheets indicate 15 L canisters. If I back calculate all data using 15 L canister volume; the resulting calculated sample volume using the ideal gas law matches well with the expected sample volume based on flowrate and sample time.*

*My concern would be: Does this error continue downstream in the Enthalpy process to calculate a resulting concentration? I'm 95% convinced that the resulting canister Dilution Factor wouldn't change; however I don't know enough about the Enthalpy analysis and process to be sure that the resulting calculated concentration in the canister isn't affected.*

- Status of testing/results from Ex. 4 CBI LD Gasoline Truck (Phase 6)
- Status of contract for obtaining summa canisters from Enthalpy for nonroad testing at OTAQ
- Missing dyno data (Vmix and miles)
- Any bits of wisdom from Tom before he leaves us?

## Appointment

**From:** Hoyer, Marion [hoyer.marion@epa.gov]  
**Sent:** 6/4/2019 4:59:20 PM  
**To:** Hoyer, Marion [hoyer.marion@epa.gov]; Cullen, Angela [cullen.angela@epa.gov]; Nelson, Brian [nelson.brian@epa.gov]; Michael Olechiw [olechiw.michael@epa.gov] [olechiw.michael@epa.gov]; Fernandez, Antonio [fernandez.antonio@epa.gov]; Cook, Rich [Cook.Rich@epa.gov]; Geidosch, Justine [Geidosch.Justine@epa.gov]; Laroo, Chris [laroo.chris@epa.gov]; Walters, Charles [walters.charles@epa.gov]  
**Subject:** EtO in mobile exhaust  
**Location:** AA-Room-Office-C34-ConfRoom/AA-OTAQ-OFFICE  
**Start:** 6/5/2019 1:30:00 PM  
**End:** 6/5/2019 2:00:00 PM  
**Show Time As:** Busy

**Required Attendees:** Cullen, Angela; Nelson, Brian; Michael Olechiw [olechiw.michael@epa.gov]; Fernandez, Antonio; Cook, Rich; Geidosch, Justine; Laroo, Chris; Walters, Charles

Brian expressed interest in reviewing our test plans and priorities so far (at NRMRL) and discussing the testing we want to prioritize here. We'll also use this as an opportunity to bring Chuck Walters into this issue and answer any questions.

We have a quick update with Bill on this topic Monday at 9am so we can also check in on the highlights we want to make sure he is aware of.

Here is NRMRL's plan so far. We are anticipating that Phase 5 would be a HDDT on their dyno (they have plans to rent this vehicle):

**Phase 1 (Complete)**

Source: Light-duty SI vehicle

Dilution: Can 0098 was 30.16:1; Can 0080 was 18.99:1; Can 0001 was 21.18:1. The dilution ratio varied during Cans 0728, 0039, and 0066 in the range of 26:1.

**Phase 2 (June 3)**

Vehicle: Ex. 5 Deliberative Process (DP) Regular Cab, Ex. 5 Deliberative Process (DP) 6.7L, Class 6 Heavy-Duty Diesel Truck with exhaust aftertreatment (EGR, DPF, SCR, DOC)

Fuel: Ultra-low sulfur diesel fuel.

Lab: Heavy-duty dynamometer facility.

Sampling days: 3

Driving schedule: HD-UDDS (1060 second, 5.5 miles)

There will be both a cold-start HD-UDDS and, after a soak, a hot-start HD-UDDS. Both will be tested on each of the 3 days of testing. Each day there will be a sample of the lab air. (Dilution and intake air are not pre-conditioned in this facility so there will not need to be additional samples taken to differentiate those two instances of ambient conditions.) One of the hot start test sample cans will be spiked with EtO prior to sample collection. One blank will be taken during the test week.

Total Cans Phase 2 – 6 source, 7 ambient, 1 blank, 1 spiked → 15 total

4 controllers for 1060 seconds for two of the three days

5 controllers for 1060 seconds for the third day

Duration for all cans is 1060 seconds.

**Phase 3 (June 17)**

Vehicle: A common naturally aspirated PFI light-duty vehicle

Fuel: Tier 3 E10 cert fuel

Lab: Light-duty dynamometer facility.

Sampling days: 3

Driving schedules: FTP75 and Supplemental FTP.



Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

**Cans required:**

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

**Controllers required:**

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds

- 3 controllers set for 505 seconds.
- 10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)
- 9 controllers set for 596 seconds (3 source, 6 background)
- The blank and the outdoor ambient sample do not require controllers.

**Phase 4 (June 24 or July 8)**

Vehicle: Ex. 5 Deliberative Process (DP) turbocharged GDI 2.7L (same vehicle as Phase 1).

Fuel: Tier 2 certification fuel or market E0 fuel

Lab: Light-duty dynamometer facility.

Sampling days: Three test days.

Each day there will be an FTP75 and Supplemental FTP. The 505 second- cold start, a composite of the 1372 second-7.5 mile stabilized and warm start of the FTP75; and the 596 second – 8.01 mile transient US06.

**Cans required:**

- For the cold start phase of the FTP there will be a source can but no background.
- For the composite of the stabilized phase and the hot start phase of the FTP there will be one source and two backgrounds. One of those background samples will be taken at the intake air and the other one at the dilution air.
- For the Supplemental FTP (US06) there will be one source and two background cans.
- There will be one blank for this phase of testing.
- For one of the composites of the stabilized phase with the hot start phase, the can will be spiked with EtO prior to sample collection.
- There will be one can taken in the air outside of the facility.

Therefore, there will be 9 source cans, 1 spiked source can, 12 background cans, 1 blank, and one outdoor ambient can. The total number of cans required for this phase of testing is 24.

**Controllers required:**

- 1 controller per day for cold start transient, source, 505 seconds.
- 1 controller for each of two days for the composite stabilized and hot start transient, source, 1372 seconds
- 2 controllers for stabilized+hot start transient/spiked for the third day, source, 1372 seconds
- 1 controller per day for source, US06, 596 seconds.
- 2 controllers for background ambient per day, 1372 seconds
- 2 controllers per day for background ambient for 596 seconds

3 controllers set for 505 seconds.

10 controllers set for 1372 seconds (3 composites, 1 spiked composite, 6 backgrounds)

9 controllers set for 596 seconds (3 source, 6 background)

The blank and the outdoor ambient sample do not require controllers.

## Message

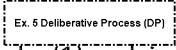

**From:** Walters, Charles [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=6FEBBEBBF7B34543BCD17A79E02AE712-WALTERS, CHARLES]  
**Sent:** 8/5/2019 11:44:23 AM  
**To:** Hildreth, Kirk [Hildreth.Kirk@epa.gov]  
**Subject:** FW: Canister volume analysis  
**Attachments:** CanisterVolumes.xlsx

More FYI on my EtO work.

---

**From:** Walters, Charles  
**Sent:** Tuesday, July 30, 2019 2:22 PM  
**To:** Cullen, Angela <cullen.angela@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>  
**Cc:** Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** Canister volume analysis

Team,

Follow-up to our discussion this morning, attached is canister volume data for the . The difference in expected canister volume based on flowrate vs calculated via three methods; namely, (1) applying the ideal gas law using Enthalpy data inputs, (2) Enthalpy reported volume, and (3) Restek sampling guide method. Please notice the yellow region highlighting the large error associated with the gasoline FTP bag 1 data on . This would indicate that proportionality is suspect.

Hopefully we can have a discussion with ORD and ultimately Enthalpy to get a better understanding of flow controller selection, flowrate QC before and after sample, and Enthalpy method and consistency of reporting canister pressurization data.

Thanks,  
Chuck

## Message

**From:** Nelson, Brian [nelson.brian@epa.gov]  
**Sent:** 6/14/2019 2:21:54 PM  
**To:** Walters, Charles [walters.charles@epa.gov]  
**Subject:** Fw: Dyno Testing in RTP

Chuck--FYI below (you weren't left off the email chain intentionally, it's just that sometimes an email exchange develops organically, adding people as the discussion progresses...and we don't always remember to make sure that the entire group is included.) Brian

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**From:** Cullen, Angela  
**Sent:** Thursday, June 13, 2019 4:35 PM  
**To:** Hoyer, Marion; McDonald, Joseph; Long, Thomas; Shores, Richard  
**Cc:** Cook, Rich; Laroo, Chris; Cook, Rich; Geidosch, Justine; Sargeant, Kathryn; Olechiw, Michael; Nelson, Brian; Fernandez, Antonio  
**Subject:** RE: Dyno Testing in RTP

I am confirming – we agree that the suggested Ex. 5 Deliberative Process (DP) should be the next vehicle tested. It is a good representation of a typical PFI vehicle. We also want to only test on E10 for this next test with this vehicle.

Thank you all!  
 Angela

---

**From:** Hoyer, Marion  
**Sent:** Thursday, June 13, 2019 2:28 PM  
**To:** McDonald, Joseph <McDonald.Joseph@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

My understanding is we'll will chase down fuel-related EtO issues at a later time if we find differences between E0 and E10. Let's hold on E15 until we learn more.

---

**From:** McDonald, Joseph  
**Sent:** Thursday, June 13, 2019 2:12 PM  
**To:** Hoyer, Marion <hoyer.marion@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

Is there any E15 useage in Illinois? An FFV would be OK on E15 if we wanted to take a look at E0, E10, and E15. That would give a range of fuels and E15 is getting a summer waiver.

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**From:** Hoyer, Marion  
**Sent:** Thursday, June 13, 2019 2:00 PM  
**To:** McDonald, Joseph <McDonald.Joseph@epa.gov>; Long, Thomas <Long.Thomas@epa.gov>; Cullen, Angela <cullen.angela@epa.gov>; Shores, Richard <Shores.Richard@epa.gov>  
**Cc:** Cook, Rich <Cook.Rich@epa.gov>; Laroo, Chris <laroo.chris@epa.gov>; Cook, Rich <Cook.Rich@epa.gov>; Geidosch, Justine <Geidosch.Justine@epa.gov>; Sargeant, Kathryn <sargeant.kathryn@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>  
**Subject:** RE: Dyno Testing in RTP

In terms of the fuel, we would like E10 cert fuel and not E85. Angela can confirm.  
Thanks Tom!

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**From:** McDonald, Joseph  
**Sent:** Thursday, June 13, 2019 1:28 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Cc:** Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Geidosch, Justine <[Geidosch.Justine@epa.gov](mailto:Geidosch.Justine@epa.gov)>; Sargeant, Kathryn <[sargeant.kathryn@epa.gov](mailto:sargeant.kathryn@epa.gov)>; Olechiw, Michael <[olechiw.michael@epa.gov](mailto:olechiw.michael@epa.gov)>; Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)>; Fernandez, Antonio <[fernandez.antonio@epa.gov](mailto:fernandez.antonio@epa.gov)>  
**Subject:** RE: Dyno Testing in RTP

It's a data point. It might be good to test something newer, but it was relatively high volume six years ago. In general, we should probably look at certification data and projected volume and test a number of vehicles that are segment leading. The Ex. 5 Deliberative Process (DP) has been a segment leader.

-Joe

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**From:** Hoyer, Marion  
**Sent:** Thursday, June 13, 2019 12:54 PM  
**To:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Cc:** Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Geidosch, Justine <[Geidosch.Justine@epa.gov](mailto:Geidosch.Justine@epa.gov)>; Sargeant, Kathryn <[sargeant.kathryn@epa.gov](mailto:sargeant.kathryn@epa.gov)>; Olechiw, Michael <[olechiw.michael@epa.gov](mailto:olechiw.michael@epa.gov)>; Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)>; McDonald, Joseph <[McDonald.Joseph@epa.gov](mailto:McDonald.Joseph@epa.gov)>; Fernandez, Antonio <[fernandez.antonio@epa.gov](mailto:fernandez.antonio@epa.gov)>  
**Subject:** RE: Dyno Testing in RTP

I'm just folding in Tony and Joe M with this email.

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**From:** Long, Thomas  
**Sent:** Thursday, June 13, 2019 12:05 PM  
**To:** Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Cc:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Geidosch, Justine <[Geidosch.Justine@epa.gov](mailto:Geidosch.Justine@epa.gov)>; Sargeant, Kathryn <[sargeant.kathryn@epa.gov](mailto:sargeant.kathryn@epa.gov)>; Olechiw, Michael <[olechiw.michael@epa.gov](mailto:olechiw.michael@epa.gov)>; Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)>  
**Subject:** RE: Dyno Testing in RTP

For the PFI, we have on hand a 2013 Ex. 5 Deliberative Process (DP). It is a flex fuel vehicle. Do you still want us to use Tier 3 E10 or would you like us to use E85 from the pump? Using this vehicle would save us the cost of leasing a vehicle.




Thomas Long, Mechanical Engineer  
 Mail Drop E343-02  
 Building D Room 360  
 109 T. W. Alexander Drive  
 Research Triangle Park, NC 27711  
 Phone: 919-541-3944

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**From:** Cullen, Angela  
**Sent:** Friday, May 17, 2019 3:04 PM  
**To:** Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>; Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Cc:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Laroo, Chris <[laroo.chris@epa.gov](mailto:laroo.chris@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>; Geidosch, Justine <[Geidosch.Justine@epa.gov](mailto:Geidosch.Justine@epa.gov)>; Sargeant, Kathryn <[sargeant.kathryn@epa.gov](mailto:sargeant.kathryn@epa.gov)>; Olechiw, Michael <[olechiw.michael@epa.gov](mailto:olechiw.michael@epa.gov)>; Nelson, Brian <[nelson.brian@epa.gov](mailto:nelson.brian@epa.gov)>  
**Subject:** RE: Dyno Testing in RTP

Richard and Tom,

Thank you for our discussions this week and your work on this project. This email is to circle back with what we discussed yesterday. Our near-term priorities are:

1.  GDI, normal test conditions - completed
2.  diesel, normal test conditions, with cold-start UDDS and warm UDDS cycles
3. TBD LD gasoline vehicle (PFI, naturally-aspirated, Tier 2 or Tier 3 certification level, significant sales volume), E10 fuel, FTP cycle, normal test conditions
4.  GDI, normal test conditions, Tier 2 certification fuel or market Eo fuel, FTP cycle

The other testing suggestions you sent are still important, but we want to first scope out which mobile source sectors emit EtO. We will be having discussions with our lab early next week to explore what we can do to test nonroad engines.

When you get a chance, would you please send a picture of the  emission control label?

Thank you,  
Angela


---

**From:** Hoyer, Marion  
**Sent:** Wednesday, May 15, 2019 4:38 PM  
**To:** Shores, Richard <[Shores.Richard@epa.gov](mailto:Shores.Richard@epa.gov)>  
**Cc:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>; Cullen, Angela <[cullen.angela@epa.gov](mailto:cullen.angela@epa.gov)>; Cook, Rich <[Cook.Rich@epa.gov](mailto:Cook.Rich@epa.gov)>  
**Subject:** RE: Dyno Testing in RTP

Hi Richard,

I just made it back to my phone. I can call you if that would be helpful.  
 This is an excellent list of some of the top priorities as we see them too. Given the urgency around getting some initial/screening diesel data it might make sense to start there and then meet next week to discuss further testing with Angela and our light-duty center director, Mike Olechiw.

For the testing next week on the diesel can you run both a cold and warm cycle? I am not a testing expert so I've cc'd Angela as this is her area of expertise. If at all possible, this testing is the current highest priority.

We will start the PR for  so that we can get funds supporting this work ASAP. I am confident we can send additional funds in June or July. Since we'll figure that out as we go, it sounds from your note like that kind of incremental funding situation could work, but we can discuss this further.

After we get a chance to orient Bill Charmley, our division director, to the results tomorrow, we will be setting up recurring meetings with him and we will invite you to those recurring meetings so that he can also hear from you directly and we can be discussing next steps in real time together.



I honestly cannot thank you enough not only for making this work your top priority, but the fact that you are generating the highest quality data possible in this emerging issue that has many complexities, is extraordinarily commendable.

Thank you!  
Marion

---

**From:** Shores, Richard  
**Sent:** Wednesday, May 15, 2019 4:01 PM  
**To:** Hoyer, Marion <[hoyer.marion@epa.gov](mailto:hoyer.marion@epa.gov)>  
**Cc:** Long, Thomas <[Long.Thomas@epa.gov](mailto:Long.Thomas@epa.gov)>  
**Subject:** Dyno Testing in RTP

Marion,  
 After some discussion with Tom, we have come up with a preliminary strategy for the testing that could be possible. Keep in mind that vehicle testing typically costs us \$30k, including the rental and no EtO testing. This last round of EtO testing costs us \$20k. We are considering the following tests/vehicles.

1.  GDI, normal test conditions completed
2.  diesel, maybe start next week without integrated modal HC data
3. Class 8 diesel, should have integrated modal HC data being recorded
4. PFI, gas, considering the idea of two tests, normal and cold test conditions

5. ☐ GDI, cold test conditions
6. ☐ TBD vehicle, possible some pre/post catalyst sampling with canisters only?

Notice we are suggesting cold condition testing, what do you think? This data set in completion should go a long way to defining if the mobile source emissions are a significant component of the inventory. Our testing programs are typically buffered with time, allowing us the opportunity to leverage other project resources but more importantly the time we have available for those primarily responsible for the dyno operation. Given our need to collect data at an accelerated schedule translates into additional contractor support and additional costs. Given all the variables here and understanding that every test we conduct may cause us to change direction, my suggestion is to start the ☐ testing as soon as we can, with or without a continuous HC monitor. Testing the vehicles listed above is assumed to cost more than ☐ but if you have that available, maybe we (ORD) can cover the additional costs. As this sampling occurs, we can keep ~~it~~ ☐ on the budget, specifically what the testing actually costs. Ultimately, we would like to complete the testing above with the funds available.

Richard Shores  
U.S. Environmental Protection Agency (E343-02)  
Office of Research and Development  
National Risk Management Research Laboratory  
Air and Energy Management Division  
Distributed Source & Buildings Branch  
Research Triangle Park, NC27711, USA  
Phone: (919) 541-4983  
email: [shores.richard@epa.gov](mailto:shores.richard@epa.gov)

## Message

**From:** Imfeld, Sterling [imfeld.sterling@epa.gov]  
**Sent:** 6/24/2019 11:26:27 AM  
**To:** Walters, Charles [walters.charles@epa.gov]  
**Subject:** RE: nonroad SI EtO testing

Chuck, there always seems to be some confusion when speaking to CD about fuels. I would recommend taking an extra moment to ensure that you all agree on exactly what fuel you plan to run during this testing, and ensure that the Chem lab has fuel reports that have all the pertinent information before running with any fuel.

Thanks for sharing all of this.

Sterling

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**From:** Walters, Charles  
**Sent:** Monday, June 24, 2019 7:01 AM  
**To:** Cullen, Angela <cullen.angela@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Nelson, Brian <nelson.brian@epa.gov>; Imfeld, Sterling <imfeld.sterling@epa.gov>; Hoyer, Marion <hoyer.marion@epa.gov>  
**Subject:** nonroad SI EtO testing

Team,

For the nonroad SI EtO test discussion meeting this afternoon.

**Proposed Engines:**

**Ex. 5 Deliberative Process (DP)**

Both engines are Nonhandheld, carbureted, and uncatalyzed and are EPA-owned. At 14 kW, the horizontal is in the upper range of NRSI (defined as 19 kW or less). The vertical engine would allow similar dilution using the site's smallest venturi (350 scfm).

**Next Steps for Prepping Cell for Summa Canisters**

For Nonhandheld, the test is a 6-mode, weighted steady state test. So this would require 6 canisters per test (7 if we include background).

For discussion

- Do we want to run the 6 mode test?
- Or run a representative mode? (If so, I would propose mode 3 at 50% load or mode 4, at 25% load as these modes have the heaviest weighting at 0.29, 0.30 respectively)
- E0 and E10?
- Are we interested in background? (backgrounds of F150 tests were below DL)
- Are we interested in criteria emissions?
- Canister and Controller Availability
- Sample Analysis



- Sample Line and Probe
- Nonroad SI compliance season (starts in August)

Thanks,  
Chuck